Unesco-UNEP International Environmental Education Programme

Environmental Education Series **27**

AN ENVIRONMENTAL EDUCATION APPROACH TO THE TRAINING OF ELEMENTARY TEACHERS: A TEACHER EDUCATION PROGRAMME

A Discussion Document for Unesco Training Seminars on Teacher Training in Environmental Education

Division of Science, Technical and Environmental Education

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Unesco-UNEP International Environmental Education Programme

Environmental Education Series **27**

An Environmental Education Approach to the Training of Elementary Teachers: A Teacher Education Programme

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PREFACE

This document describes a rather ideal elementary teacher education programme (TEP) for training elementary school teachers to environmentalize the content and methods of the early years of education. This programme is described as a four-year teacher education programme, laid out basically as the authors would like to see it in a situation where time and resources are available. As a somewhat ideal model, the contents of this document are certainly open to revision in situations where time and resources will not permit its total implementation. Knowing that some nations have two or even three year teacher education programmes for the training of elementary teachers, the authors recommend a careful selection of courses which will, in fact, help train effective and responsible environmental educators.

The major focus of this document is infusion, i.e., incorporating environmental content and methods in existing or planned courses of instruction in the TEP. The secret of the success of any infused programme lies in collegiate administrators and professors/instructors who are able and willing to make infusion work. No document can dictate this kind of dedication or cooperation and, therefore, these topics are covered only sparsely here. Even so, a tertiary (collegiate) staff that is willing to environmentalize the TEP should consider the advisability of inservice "teacher education" for the staff that will carryout the programme. This would bring together the faculty responsible for infusing the programme and also, quite possibly, develop the collegiality that will be necessary in making the infusion process work.

This document is, hopefully, laid out in a manner that will prove meaningful and helpful to its readers. A number of foundational topics are included in Part I. Among these topics in Part I are the very important goals for the TEP. Also included are discussions on learner objectives as they relate to the goals, the role of citizenship responsibility (environmental action), and environmental sensitivity. Part II deals with topics of infusion and the infusion strategy. Part III lays out the entire TEP, providing an overall description of each course and making definite suggestions for the infusion of EE into appropriate courses. Part IV, Planning for Instruction In Environmental Education, focuses on the critical variables of instruction and methods. It discusses critical outcomes of instruction and strategies for successfully seeing these outcomes realized in students. It also describes, in some depth, the very effective General Teaching Model (GTM), resources for instruction, inventorying community resources available for instruction, the effective use of field trips, and problems solving as a strategy for environmental education. Part V has been developed in order to present, in some detail, example infusion activities for use in the TEP. The infusion activities displayed in Part V cover both the general education component and professional education component of the TEP. Thus, they should be inspected carefully for use as they are and utilized to generate ideas for additional infusion activities and strategies.

This doument was prepared by Dr. Harold Hungerford, Dr.Trudi L. Volk, Dr. Billy G. Dixon, Dr. Thomas J. Marcinkowski, Dr. Archibald P.C.Sia and edited by Dr. Shahrir Jamaluddin. Unesco is appreciative of their collaboration in the preparation of this document.

Suggestions for improving the contents of this document in its future revision will be received with thanks at the Environmental Education Section, Division of Science, Technical and Environmental Education, Unesco, 7 Place de Fontenoy, Paris 7, France.

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PART I

GOALS AND ALLIED TOPICS

> "The conclusion that arises most clearly and pervasively from a consideration of needs in the training of teachers for environmental education is that a broad, multifaceted approach is necessary. A long and arduous journey separates conference rhetoric and goal-setting from practical implementation of effective teacher-training programmes."
>
> S. Selim, 1977

The purpose of this document is to transcend the rhetoric of environmental education (EE) and to develop a teacher training programme for elementary teachers that will, in fact, result in the training of environmentally literate students. Rhetoric aside, it is incumbent on the writers - as well as those responsible for establishing teacher training programmes - to have in place a set of goals on which to base curricular decisions. With this challenge in mind, the writers choose to focus the development of this document on a rational and valid set of goal statements for EE which has been shown effective in changing learner behavior when implemented through well developed curricular programmes.

The goals on which this document will be based are modified from those developed by Hungerford, Peyton, and Wilke and published in 1980. These goals were written to be consistent with the categories of objectives included in the Tbilisi Conference Report (1978). The ultimate aim is paraphrased from Harvey (1977) following his exhaustive research on the substantive structure of EE. The goal levels should be viewed as hierarchical and considered as such when infused into the teacher education programme. In addition, it should be clear that specific learner objectives must be developed for instructional activities which have been designed to facilitate accomplishing the goals and the ultimate aim of EE.

GOALS FOR THE PRESERVICE TEACHER EDUCATION PROGRAMME

THE ULTIMATE AIM

The ultimate aim of EE is to aid citizens in becoming environmentally knowledgeable and, above all, skilled and dedicated for working, individually and collectively, toward achieving and/or maintaining a dynamic equilibrium between quality of life and quality of the environment.

GOAL LEVEL I

THE ECOLOGICAL FOUNDATIONS LEVEL

Upon completion of an elementary teacher education programme designed to develop an effective environmental educator, the inservice elementary school teacher should be expected

to be able to . . .

1. . . . communicate and apply - in an educational setting - the major ecological concepts including those focusing on individuals, species populations, communities, ecosystems, biogeochemical cycles, energy production and transfer, interdependence, niche, adaptation, succession, homeostasis, and man as an ecological variable.

2. . . . apply a knowledge of ecological concepts to the analysis of environmental issues and identify important ecological principles involved.

3. . . . apply a knowledge of ecological concepts in predicting the ecological consequences of alternative solutions to environmental problems.

4. . . . understand the principles of ecology in order to identify, select and utilize appropriate sources of scientific information in a continuing effort to investigate, evaluate and find solutions for environmental issues.

GOAL LEVEL II

THE CONCEPTUAL AWARENESS LEVEL

5. . . . understand and communicate how man's cultural activities (e.g., religious, economic, political, social and others) influence the environment from an ecological perspective.

6. . . . understand and communicate how an individual's behaviors impact on the environment from an ecological perspective.

7. . . . identify a wide variety of local, regional, national and international environmental issues and the ecological and cultural implications of these issues.

8. . . . identify and communicate the viable alternative solutions available for remediating crucial environmental issues as well as the ecological and cultural implications of these various solutions.

9. . . . understand the need for environmental issue investigation and evaluation as prerequisite to sound decision making.

10. . . . understand the roles played by differing human beliefs and values in environmental issues and the need for personal values clarification as an important part of environmental decision making.

11. . . . understand the need for responsible citizenship action in the solution of environmental issues.

GOAL LEVEL III

THE INVESTIGATION AND EVALUATION LEVEL

12. . . . apply the knowledge and skills needed to identify and investigate issues (using both primary and secondary sources of information) and synthesize the data gathered.

13. . . . demonstrate the ability to analyze environmental issues and the associated value perspectives with respect to their ecological and cultural implications.

14. . . . demonstrate the ability to identify alternative solutions for important issues and the value perspectives associated with these solutions.

15. . . . demonstrate the ability to evaluate alternative solutions and associated value perspectives for important issues with respect to their ecological and cultural implications.

16. . . . demonstrate the ability to identify and clarify personal value positions related to important environmental issues and their associated solutions.

17. . . . demonstrate the ability to evaluate, clarify, and change value positions in light of new information.

GOAL LEVEL IV

THE ENVIRONMENTAL ACTION SKILL LEVEL

18. . . . demonstrate a competence with a variety of citizenship action skills from the following categories of skills: persuasion, consumerism, political action, legal action, and ecomanagement.

19. . . . evaluate selected actions in light of their ecological and cultural implications.

20. . . . demonstrate the ability to apply one or more citizenship action skills for the purpose of resolving or helping to resolve one or more environmental issues.

GOAL LEVEL V

THE INSTRUCTIONAL APPLICATION LEVEL

21. . . . demonstrate the ability to effectively implement instructional materials designed to assist the development of environmentally literate students, i.e., students who are both competent with and willing to apply critical environmental knowledge and skills.

TOPICS RELATED TO THE GOALS

Readers are not asked to accept the goals as stated in Part I without questioning their validity and utility. Similarly, there are other ancillary topics of importance that should be addressed to help professionals view these goals as desirable for use (or undesirable as the case may be) in their particular educational situations. Validity considerations will be herewith communicated in a number of ways as will other topics associated with the goals and their use.

Validity Considerations

In an effort to assess the content validity of the goals, the goal developers determined to compare the goals expressed at each of the first four levels with the five categories of environ-

mental education objectives proposed at the Tbilisi Conference. To make the comparison, the developers constructed a two-axis comparison grid. Using this grid, the developers independently analyzed each goal, identifying where an interface existed with the Tbilisi objective statements. Following this individual assessment, the developers met together to synthesize the individual analyses. They discovered that the goals bore a marked correspondence with the Tbilisi objectives. Observing this agreement, the developers inferred a substantial degree of content validity for the goals as originally written.

Subsequent to the developers' initial content validity assessment, they submitted the goals to a validity panel consisting of seven nationally (USA) recognized environmental educators. Validity panelists were asked to respond to a series of questions which would rigorously inspect the goals and their validity. Completed validity assessments were received from five of the seven panelists. In general, the comments received from the panelists were consistent. The goals were revised in accordance with the panelists' comments and considered valid.

The goals were published in 1980 along with a detailed statement of the assumptions made by the developers. The stage was thus set for the goals to be used in a variety of ways by professional environmental educators and curriculum developers at all levels. Interestingly, the writers of this document have observed that the goals have, indeed, been widely used in the field which helps further establish their validity. A brief description of some of these uses follows.

Uses: Since their development, a major use of the EE goals has been in the area of research. Numerous studies have ultilized the goal levels as an organizational framework or have directly investigated outcomes related to one or more of the goal levels.

Among those studies which used the EE goals as an organizational framework are those of Gardella (1986), Stevenson (1986) and Volk, et al. (1984). Gardella's research focused on the development of an instrument wherein the EE goals were among the criteria employed in assessing EE curricula. Stevenson, interested in an analysis of popularly used curricula in Australia and the U.S., also used the goals as criteria. In their national assessment of EE curricular needs in the U.S., Volk, et al. surveyed the responses of professional environmental educators on a number of curricular variables relative to the goals.

Although these three studies were dissimilar in method and purpose, the researchers derived conclusions which were strikingly similar. In general, they found that content and activities associated with the lower goal levels (i.e., ecological foundations and awareness) were much more prevalent in curricular materials and practice than were those which addressed the higher goals (i.e., investigation/evaluation and action). Interestingly, those findings are consistent with Childress' (1978) study of EE curricula used in U.S. schools.

Volk, et al. also found a high degree of agreement among formal and nonformal educators relative to the importance of these EE goals across academic levels (elementary through tertiary). This consistency of agreement in a national sample further attests to the validity of these goals for EE.

A second body of research includes studies which directly investigated outcomes related to one or more of the goal levels. Ramsey, et al. (1981) and Klingler (1980) both implemented an EE program based on the goals and attempted to ascertain whether such goal-based instruction did, in fact, elicit positive environmental behavior. The results of both studies strongly suggest that youngsters who were allowed to develop and apply the knowledge and skills reflected throughout the first four goal levels did initiate and participate in responsible environmental behavior to a greater degree than youngsters who had experienced only environmental awareness-oriented instruction. Thus, it would appear that these EE goals comprise a consistent, effective, and logical sequence from an instructional perspective.

Also included within the research which investigated outcomes associated with goal levels are studies by Champeau, et al. (1980) and Peyton and Hungerford (1980). These two studies are notable in that they addressed teacher samples relative to the goal levels and are particularly pertinent to goal level five (instructional application).

Champeau, et al. questioned elementary and secondary teachers regarding their understanding of each of the goal levels and their self-reported ability to implement instruction relative to each level. Peyton and Hungerford chose to focus their research on the fourth goal level (action) and investigated the abilities of teachers (preservice and inservice) to identify, teach, and implement environmental action skills. The sample of teachers in this study perceived that they had limited environmental action skills and very few reported an active involvement in environmental action. In general, these teachers felt that they could teach, but not prepare, environmental action materials.

The Role of Learner Objectives

The goals, as stated, are simply a framework from which curricula or instructional sequences can be developed. They act as guidelines for desirable educational outcomes. Thus, there needs to be an intermediate step between the goals themselves and instruction (or the development of instructional packages). This intermediate step is the preparation of "learner objectives" (sometimes called performance objectives).

The instructional developer is responsible for determining exactly what the learner should learn and how that learning should be displayed or observed. It is also incumbent on the developer to state these "learner objectives" in such a way as to communicate to the learners what their tasks are.

This document is not intended to be a text on curriculum development or on the preparation of learner objectives. Even so, the reader may appreciate examples of learner objectives in the context of the goals as presented here. Similarly, it is entirely possible that some examples might aid in conceptualizing how the goals can be infused into general education and teacher education programmes. What follows, then, is an effort to display sample learner objectives in the context of the EE goals. The reader can infer where such objectives would best fit in a collegiate programme designed to train elementary teachers capable of teaching environmental concepts and skills.

Goal Level I (The Ecological Foundations Level) Goal No. 1: . . . communicate and apply in an educational setting - the major ecological concepts including those focusing on individuals, species populations, communities, ecosystems, biogeochemical cycles, energy production and transfer, interdependence, niche, adaptation, succession, homeostasis, and man as an ecological variable.

Sample Learner Objectives

Subsequent to instruction, the learner should be able to . . .

1. . . . communicate the major conceptual differences between an ecological community and an ecosystem.

2. . . . conduct a field investigation which includes the analysis of two separate forest ecosystems and determine the successional stages represented by each.

3. . . . compute population density using the formula D = N/S.

4. . . . explain why a species population can be considered as a specific level of organization in the biosphere.

5. . . . define homeostasis and apply this concept to a discussion of a particular ecosystem in the region.

6. . . . observe a discrete ecosystem and describe (using diagrams) at least two ways in which food energy flows through that system.

Goal Level II (The Conceptual Awareness Level) Goal No. 10: . . . understand the roles played by differing human beliefs and values in environmental issues and the need for personal values clarification as an important part of environmental decision making.

Sample Learner Objectives

Subsequent to instruction, the learner should be able to . . .

1. . . . read two issue-oriented news articles and state at least two differing value positions as expressed in each article.

2. . . . locate two separate issue-oriented information sources and compare and contrast the beliefs and values expressed in each.

3. . . . describe how differing international (governmental) beliefs and values play a role in the development of a particular issue (e.g., acid rain in North America or Europe, harvesting the great whales, desertification in Africa, deforestation of tropical rain forests, marine fisheries management).

4. . . . - given a particular environmental issue or an organization's position (or posture) on that issue - explain how that organization's beliefs influence its values and, therefore, its position.

Goal Level III (The Investigation and Evaluation Level) Goal No. 12: . . . apply the knowledge and skills needed to identify and investigate issues (using both primary and secondary sources of information) and synthesize the data gathered.

Sample Learner Objectives

Subsequent to instruction, the learner should be able to . . .

1. . . . identify several environmental issues which lend themselves to gathering information using: A) surveys, B) questionnaires, and C) opinionnaires.

2. . . . identify an issue of local or regional concern and make a list of the information that needs to be collected during an investigation of that issue.

3. . . . plan for and conduct a research study which focuses on the use of a survey, questionnaire or opinionnaire.

4. . . . demonstrate the ability to identify and write to governmental or private agencies for specific information about environmental issues.

5. . . . after locating an article on a current issue, prepare a written summary which accurately communicates the main points of that article.

6. . . . - given a research question and a set of data relative to that question - formulate and defend in writing logical conclusions, inferences, and recommendations based on the data.

Goal Level IV (The Environmental Action Skills Level) Goal No. 18: . . . demonstrate a competence with a variety of citizenship action skills from the following categories of skills: persuasion, consumerism, political action, legal action, and ecomanagement.

Sample Learner Objectives

Subsequent to instruction, the learner should be able to . . .

1. . . . describe the dangers of persuasive actions based only on emotional appeals.

2. . . . identify at least three environmental problems or issues in your region which could require ecomanagement (physical intervention) type actions.

3. . . . explain why actions taken by organized groups are usually more effective than actions taken by individuals.

4. . . . - given a particular issue or given the opportunity to select your issue - prepare a plan of action designed to help resolve that issue. This action plan must include detailed descriptions of proposed actions and of how these actions are to be carried out.

[Note: Additional learner objectives included in Part III course descriptions.]

Comments on Environmental Action in Education

Opinions differ on the role of environmental action (citizenship action) in formal education. There are those who take the position that it is appropriate for educators to direct students to take action whether or not the action agrees with the beliefs and values of the students. The writers disagree with this position, particularly at the elementary and secondary school levels. It is appropriate, however, to direct students to acquire the skills of responsible citizenship action and demonstrate those skills in surrogate classroom situations. In keeping with the role of citizenship in a society, it seems responsible for a teacher to support student actions, if these actions are socially and ecologically responsible, but not to force students into acting in the community or region in which they live.

Therefore, it appears that there is an ethical responsibility on the part of educators to help students become skilled in citizenship roles but to defer to the student's own beliefs and values in terms of what the student chooses to do. In a previous section, the research studies of Ramsey and Klingler were briefly discussed, noting that training in environmental action skills did, indeed, result in students becoming active in a variety of issues. Under no circumstances, however, were these actions forced on the youngsters.

At the college (teacher education) level, the situation may be slightly different, however. In the training of teachers who will have a responsibility for teaching youngsters to become environmentally responsible, it may be appropriate to insist that the preservice teachers demonstrate their skills in a community/regional setting. Even so, it is probably ethical only to insist on a demonstration of citizenship responsibility, not on a particular action that might run counter to the student's beliefs and values. At least two of the writers of this document have used this strategy successfully. Furthermore, there have been instances when entire classes of students have agreed to work cooperatively on a given action strategy. In most instances, however, the actions chosen and the issues engaged in were not ones with serious political or social overtones.

It is, therefore, incumbent on the professional educator to make carefully thought out decisions concerning the role of environmental action in a given instructional programme.

Environmental Sensitivity - A Foundational Variable

It should be noted that in addition to the EE goal levels used in this document, an additional goal is stated or at least strongly implied in the Tbilisi Objectives. That is the goal of environmental sensitivity. More appropriately stated, environmental sensitivity can be viewed as a pre-goal, or foundational goal, to the previously described goal levels.

Environmental sensitivity might be defined as "a set of affective characteristics which result in an individual viewing the environment from an empathetic perspective" (Peterson, 1982). Individuals who are sensitive to the environment possess a basic appreciation and concern for the natural environment. These characteristics, however, are often of insufficient intensity to motivate individuals to alter their behavior on behalf of environmental quality.

The research into environmental sensitivity is limited and relatively recent in origin. However, a related body of research suggests that environmental sensitivity is a significant and major predictor of environmentally responsible behavior (Hines, et al., 1986/87; Marcinkowski, 1987; Sia, et al., 1986). As such environmental sensitivity may well be an important precursor to environmental awareness and to environmentally ethical and responsible behavior. If there is merit to this supposition, then the development of environmental sensitivity is most certainly pertinent to this discussion.

To date, there have been two major research efforts related to environmental sensitivity: Peterson's (1982) study of the developmental variables which affect environmental sensitivity and Tanner's (1980) research which identified variables which led individuals to careers in the conservation field. Because Peterson's work directly addressed environmental sensitivity, her findings will contribute to the bulk of this discussion, although it should be noted that Tanner's findings provided strong corroboration to those of Peterson.

What does the research into environmental sensitivity suggest about its development? Apparently, there are affective and cognitive aspects to the development of sensitivity. While sensitivity is itself an affective variable, its development appears to result from an interplay of outdoor experiences, favorable human interactions, and knowledge about natural systems. Peterson's sample of professional environmental educators reported an interest in the outdoors and natural systems which contributed to an initial environmental sensitivity at an early age ($\bar{X}$ = 12.25 years). Enriched by frequent experiences in natural settings and open spaces, this sensitivity continued to grow and strengthen through the years. This environmental sensitivity

was further reinforced by an increasing knowledge about natural systems and was nurtured through both familial and non-familial role models who were themselves empathetic toward the environment and actively involved in environmental activities and interests. These findings suggest several dimensions to environmental sensitivity and carry import for the environmentally literate learner as well as for the teacher who must facilitate the development of that learner. The following sections will address the development of both the environmental learner and the environmental teacher.

The formative outdoor experiences described by Peterson's sample included activities such as exploring and playing as a child, hunting and fishing, and involvement in youth organizations or group camping. Moreover, those experiences were often solitary, or with a small group of peers, or in a family setting. Formal pre-college education would be hard-pressed to include within its curricula those kinds of activities and opportunities described by Peterson's sample. Formal pre-college education can include, however, two other salient factors of environmental sensitivity development. Those two factors, role models and environmental knowledge, appear to be closely related. Peterson suggested that "educator role models appear to be equally as important as outdoor experiences in developing [environmental sensitivity]", and that EE programs should "provide exposures to environmentally concerned and active individuals". In her study, she found that teachers constituted the majority of the role models named, stimulating interest in environmental systems and providing educational and professional guidance.

The question pertinent to this document, then, is how to train such a teacher. Research strongly suggests the merit of youthful outdoor experience. As was noted above, the average age pinpointed for the initiation of environmental sensitivity was 12.25 years. Teacher education institutions cannot guarantee that individuals entering their programmes have had access to youthful outdoor experiences. These institutions, however, can provide preservice teachers with experiences in natural settings through course-related field work, as well as through non-formal organizations. Every effort must also be made to provide interesting and informative coursework about ecology and natural settings, and to provide effective role models by way of professors who are actively involved with environmentally responsible concerns. While attending to the development of environmental sensitivity in preservice teachers by those means, the teacher preparation programme must also ensure that the teachers it produces have the capabilities to serve, in turn, as facilitators of environmental sensitivity in their students.

In closing, the preservice teachers themselves must possess environmentally appropriate attributes. These individuals must embody the knowledge, skills, and attitudes reflected in environmental sensitivity, ecological foundations, conceptual awareness, issue investigation and evaluation, and environmental action before they can develop those attributes within their students in a comprehensive and effective manner. Thus, the preservice teacher must feel comfortable in outdoor settings and in using the out-of-doors for instructional purposes. The preservice teacher must further have an understanding of ecological concepts and principles, and the ability to teach those ideas to youngsters in an interesting and effective manner. Lastly, the preservice teacher must understand the importance of environmental issue investigation and citizenship action and must acquire the knowledge and skills which permit him/her to become actively and responsibly involved in environmental issue remediation and the maintenance of a healthy environment.

****

"The answers to the perplexing issues associated with the environment lie not so much in an advanced technology as they do in a human population that, at long last, realizes that solutions exist in human beliefs and values and in the ability of each and every person to confront the issues in logical and productive ways. At least part of the mechanism for resolution lies with the educators who will shape the beliefs, values, and skills of young people throughout the world."

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PART II

INFUSING ENVIRONMENTAL EDUCATION INTO THE TEACHER TRAINING PROGRAMME

INTRODUCTION

Part I of this document focuses on critical goals to be met in an elementary teacher education program dedicated to the development of a skilled environmental educator. In addition, Part I deals with certain validity considerations related to the goals proposed here as well as the role of learner objectives, those guideposts used for evaluating students and instruction enroute to meeting the goals. Further, philosophical considerations related to citizenship (environmental) action are discussed along with the somewhat complex topic of environmental sensitivity.

Part III of this document will outline and describe a teacher education programme which would accomplish the prescribed mission. In addition, Part III will describe individual courses in the teacher education programme along with those goals that these courses could facilitate and example learner objectives that could be incorporated into the courses.

A basic premise of this document is that the majority of the environmental instruction will be infused into existing courses (or courses that could be established for a functional elementary teacher education curriculum). The reader will be quick to note (in Part III) that the recommended curriculum does not have a separate methods course for environmental methods. Instead, the writers recommend that the methods appropriate for education for the environment can be incorporated into existing courses, e.g., science methods, social studies methods, and the like. And, too, in the general education sequence, the only course that is recommended that would not typically be found in a general education sequence for teachers is one entitled, "Environmental Science". Thus, the stage is set for a need for a major infusion of environmental content, skills, and methods into existing courses.

THE BASICS OF INFUSION

What Is Infusion?

In education, infusion refers to the integration of certain content with existing courses in a manner as to focus on that content without jeapordizing the integrity of the courses themselves. In the case of environmental education, the professional educator carefully analyzes traditional courses for content and/or skills which could be "environmentalized". Finding such, the educator adapts that content/skills component so that environmental goals can be facilitated.

Some Examples

Let us view an excellent example of what is meant by infusion. This example focuses on the social studies and, in particular, on the essential skills for the social studies recommended by The [USA] National Council for the Social Studies (1984). If the professional social studies educator should choose to use these recommended skills as a framework for teaching both the content and methods of social studies to preservice teachers, he/she could analyze them to determine where they interfaced with the goals for environmental education. Let us look at a few examples of the skills recommended by The National Council for the Social Studies. These follow:

Selected Recommended and Essential Skills for the Social Studies:

Skills Related to Acquiring Information:

1. . . . interpret what is read by drawing inferences.
2. . . . evaluate sources of information - print, visual, electronic.
3. . . . use the community as a resource.
4. . . . use card catalog and indexes (e.g., *Reader's Guide to Periodical Literature*) to locate information.
5. . . . interpret graphs.
6. . . . conduct interviews of individuals in the community.

Skills Related to Organizing and Using Information:

1. . . . compare and contrast credibility of differing accounts of the same event.
2. . . . combine critical concepts into a statement of conclusions based on information.
3. . . . form opinion based on critical examination of relevant information.
4. . . . present visually (chart, graph, diagram, model, etc.) information extracted from print.
5. . . . recognize the values implicit in a situation and the issues that flow from them.
6. . . . identify alternative courses of action and predict likely consequences of each.
7. . . . take action to implement a decision.

Skills Related to Interpersonal Relationships and Social Participation:

1. . . . communicate own beliefs, feelings, and convictions.
2. . . . participate in delegating duties, organizing, planning, making decisions, and taking action in a group setting.
3. . . . participate in persuading, compromising, debating, and negotiating in the resolution of conflicts and differences.
4. . . . keep informed on issues that affect society.
5. . . . work individually or with others to decide on an appropriate course of action.
6. . . . accept and fulfill social responsibilities associated with citizenship . . .

If the reader compares the above listing of recommended, essential skills for the social studies with the goals for environmental education listed in Part I of this document, he/she will be quick to realize that the two lists are very interrelated. Thus, infusion of environmental

content would not only be possible, it would be extremely easy to accomplish. All of the above could be done in an environmental context and, if accomplished, this would serve as an excellent example of infusion.

Another infusion example related to the social studies might prove helpful. Social studies methods instructors often deal with a "problems/issues" component of social studies for elementary and secondary schools. The intent of this component is to teach preservice teachers how to deal with the major problems/issues of society in their classrooms. This "problems component" could demand that students learn how to develop case studies, or how to teach students the basics of issue investigation so that they can investigate social problems independently, or both. The "content" used by these instructors can be gleaned from sociology, economics, government or a number of other content areas typically associated with social studies. In an environmentally-infused programme, however, the problems/issues component of social studies methods could focus on environmental content due to the very nature of environmental issues. The environmental content might emphasize human population issues, energy issues, urban environmental issues, nuclear waste disposal issues, various pollution issues, or a host of others. This strategy would, in no way, threaten the integrity of the social studies methods course. Why? Simply because environmental issues have their roots in society due to the divergent human beliefs and values that spawned the issues in the first place.

The diagram on the next page entitled, "Infusing Environmental Content Into A Course Entitled, 'Science Process for Teachers'" provides a sketchy example of science education content that can be infused with environmental content/methods. Science, of course, provides an excellent opportunity for infusion even though many science education courses with which the writers are familiar do not utilize environmental content. By the same token, science education thought in the United States provides superb opportunities for environmental infusion. As the diagram indicates, current thought suggests that elementary science should meet four major goals: (1) meet the personal needs of children, (2) help children cope with science-related social issues, (3) meet the academic preparation needs of students, and (4) help children become aware of career opportunties in science and science-related fields. These goals provide an excellent rationale for training teachers who can deal effectively with environmental issues. These goals, then, provide an excellent opportunity for infusing science methods courses with environmental content/methods.

Some Characteristics of a Workable Infusion Strategy in Teacher Education *

When a teacher education curriculum/program is finally infused with environmental content, it is crucial to carefully supervise the infused programme to insure that the knowledge, skills, and attitudes being taught bear a one-to-one correspondence with what should be experienced by students at the elementary school level. A simple example of this would be to contend that, if it is important to teach upper elementary students how to analyze issues, we must make certain that preservice teachers are taught these same skills. This is not to say that the knowledge, skills, and attitudes should be taught at an elementary student's level. These elements should be taught at an adult learner's level. As an example, issue awareness concepts should be taught at the adult level in the teacher education programme, resulting in a much more thoroughly developed concept than one would expect from elementary grade students. Even though conceptual levels (between children and adults) differ markedly, the concepts are, by and

* - Adapted from R.J. Wilke, et al., Strategies for the Training of Teachers in Environmental Education. Paris: Unesco/UNEP, 1980.

INFUSING ENVIRONMENTAL CONTENT INTO A COURSE ENTITLED, "SCIENCE PROCESS FOR TEACHERS"

AN INFUSION POTENTIAL EXAMPLE

COURSE CONTENT	INFUSION POTENTIAL
An Introduction to Empiricism	
A Rationale for Instruction in Science Process	Yes - Here the instructor would argue the need for science and issue investigation processes as components for both science and environmental literacy.
Modern Instructional Goals for Science	
-Meeting Personal Needs of Students	Yes - This infers a need for sound decision-making based on an appropriate environmental ethic.
-Coping With Science-Related Social Issues	Yes - Many science-related social issues are environmental in nature (See Issue Investigation Skills.).
-Academic Preparation	
-Awareness of Careers in Science	Yes - To some extent. Many careers in science are environmentally-related.
Science Process Skills -Observing -Inferring -Classifying -Predicting -Hypothesizing -Designing Experiments -Collecting Data -Recording Data -Interpreting Data -Etc., Etc.	(See Issue Investigation Skills.)
Issue Investigation Skills -investigation-Identifying Issues -Analyzing Issues -Data Collection Via Secondary Sources -Data Collection Via Primary Sources -Interpreting Data -Making Recommendations, Etc.	Yes - This component trains teachers in the skills of issue investigation/evaluation. There exists tremendous infusion potential.
Investigating Issues - Application Phase	Yes - This is an excellent opportunity for infusion.

large, similar. The same holds true for process (skill) acquisition. Issue investigations, for example, will be more thoroughly accomplished at the college level than in the higher grades of the elementary school. Still, the strategies associated with these investigations are basically the same.

In education methods classes, an additional component must be considered. This component relates directly to the methods strategies recommended for teaching the desired knowledge, skills, and attitudes (and the activities associated with them). Numerous methods components must be taught and analyzed. Here it is often productive for methods students to assume the role of the learner (elementary receiver) population and actually experience the activity associated with the methods in question. However, when this technique is used, it is critically important for the methods students to analyze the methods being used by the methods instructor. The next step, of course, is for the methods students to apply those same methods either in a peer group setting or in an elementary classroom (or both). In this way, practice is gained and the college instructor is in a position to evaluate the acquisition of critically important methods. Regardless of the strategies employed in the teacher education programme, the critical ones are those which take the preservice teacher beyond hearing about a method and actually experiencing it.

Any comprehensive infusion strategy demands a great deal of cooperation from staff members who are going to be responsible for the infused programme. Further, it may be more difficult to implement a large scale infusion strategy at the college level than any other. Reasons for this are substantial. Among these are the traditional contents and methods utilized by teachers - even at the college level. Many tertiary instructors tend to teach what they have been taught and in a manner in which it was taught to them. This very real phenomenon exists even in some cases where the instructors have an attitudinal predisposition toward the environment and the need to educate teachers to provide environmental education for young learners. This condition most certainly exists in those cases where there is no attitudinal predisposition toward the environment or the need for environmental education in elementary schools. Thus, habits and attitudes can impinge negatively on the infusion strategy. In addition, other limiting factors can be associated with political resistance to such a strategy, lack of administrative support, budgetary constraints, and a prescribed curriculum. What can be done?

If we assume both political and administrative support, a great deal can be done to counteract the problems associated with tradtional content and methods. However, the strategies involved demand considerable effort on the part of agencies involved in both tertiary and teacher education. A continuing inservice training effort for college-level instructors is almost mandatory. This inservice training programme should probably be planned as an indepth institute, accomplished during the summer or academic year (or both). Such an institute could be patterned after those supported by the National Science Foundation in the United States. College-level instructors coming to such an institute could be paid a stipend and receive professional credit for attending.

A representative institute would focus on the structure and goals of environmental education (see Part I of this document) as well as infusion strategies and the content/methods associated with them. In addition, it would allow participants to identify barriers to infusion and develop mechanisms* for removing these barriers. This problem solving strategy would counteract a common propensity for looking at problems more diligently than solutions.

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* - One such problem solving mechanism can be found in: Wilke, R. J., et al. Strategies for the Training of Teachers in Environmental Education. Paris: Unesco/UNEP, 1980. P. 58.

An inservice training programme for college instructors, if conducted regionally and over a several year period, could result in hundreds (if not thousands) of professionals both willing and competent to infuse environmental education into existing or developing teacher education courses.

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"We travel together, passengers on a little space-ship, dependent on its vulnerable resources of air, water, and soil . . . preserved from annihilation only by the care, the work, and the love we give our fragile craft."

Adlai E. Stevenson

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PART III

OVERVIEW OF THE TOTAL ELEMENTARY TEACHER EDUCATION PROGRAMME

In Part I of this document, the writers posed a set of underlying assumptions which guided the overall development of the teacher education programme. In succeeding pages the programme will be presented in two components: The general studies curriculum and the professional education curriculum. The courses in each component will be identified and described. In both instances, the writers will identify the critical environmental education goals which can be addressed in these courses and offer sample objectives and activities which reflect an "environmentalized" approach to the preparation of elementary school teachers.

Prior to the development of this segment of the document, the writers initiated the task by establishing a set of parameters or premises which guided its formulation. These premises are presented next with the full realization that countries using the ideas presented in this document may have to alter the premises and/or the programme to reflect their national identities and educational needs.

PROGRAMME DEVELOPMENT PREMISES

1. The preservice elementary teacher education programme should be a baccalaureate degree course of study rather than either an associate or graduate degree programme. Although the programme might reflect a four year academic investment, the writers feel that the programme developed should represent the course work essential to develop proficient and competent teachers and should not be based on the number of hours or the time necessary to complete them, i.e., should not be based on minimum state or national requirements.

2. The courses in the programme have been established using a semester hour orientation for the sake of standardization of approach. Educational systems operating in an approach which utilizes a different delivery format may have to modify the information presented.

3. The proposed courses of study are based on a general education perspective. It is the writers' belief that such an orientation would better facilitate the development of well-rounded and effective elementary teachers and world citizens than would a highly specialized educational philosophy.

4. The total preservice elementary education programme should be a composite of both a general education and a professional education synthesis.

5. The authors recognize that many nations require the study of a foreign language as part of the general education component at the college level., Due to the diversity of requirements among the world's nations, no attempt has been made to identify a foreign language requirement as part of the general education component of the programme developed in this document.

6 The programme is based on an infusion approach where environmental education content and process are integrated into all courses (where feasible) rather than as a series of discrete courses dealing with environmental education per se.

7. All courses, whenever possible, should be activity-oriented rather than delivered in a didactic approach. Such an instructional posture should facilitate the development of critical thinking skills and problem solving skills. Moreover, it is the authors' belief that a major purpose of teaching, at all levels primary through tertiary, is to produce citizens who are competent and skilled critical thinkers. Therefore, the content and methods employed by educators (e.g., mathematics, science, social studies, professional education professors) must be the means used to achieve this purpose.

THE RECOMMENDED ELEMENTARY EDUCATION TEACHER EDUCATION PROGRAMME

The three schematics which follow display the curriculum included within the teacher preparation programme. The entire teacher education programme is first presented, followed by listing of courses included within the general education component and with the professional education component. In all cases, courses which contain environmental content and/or methods are asterisked! This conceptualization does not preclude the infusion of environmental topics into other courses, it simply identifies those courses which are most appropriate for the incorporation of an environmental infusion approach. Further, a careful examination of the course descriptions which follow the schematics will reveal strands of environmental content and methods infused throughout the academic programme. Each description of a course where environmental content is to be infused is followed by a list of "Environmental Goals to be Facilitated". These "Environmental Goals . . ." are numbered in accordance with the goals which were presented in Part I of this document. Following the "Environmental Goals . . ." will be found a list of "Sample Learner Objectives". These objectives are simply numbered in sequence and may not correspond to the numbers used in the "Environmental Goals. . .".

THE BACCALAUREATE DEGREE PROGRAM

A SCHEMATIC

The Course	Credit	The Course	Credit
YEAR ONE			
Biological Science I *	3	Biological Science II *	3
Written Communications I *	3	Written Communications II *	3
National History *	3	National Government *	3
Math: Algebra	3	Philosophy *	3
Art	3	Music	3
Physical Education	1	Physical Education	1
Total	16	Total	16
YEAR TWO			
Physical Science *	3	Environmental Science *	3
Geography *	3	Sociology *	3
Economics *	3	Math for Elementary Teachers *	3
Fundamentals of Communication *	3	Reading Methods	3
General Psychology	3	Children's Literature *	3
The Study of Teaching	3	Human Growth, Development, and Learning	3
Total	18	Total	18
YEAR THREE			
Child Psychology	3	Personal/Environ. Health *	3
Language Arts Methods *	3	Social Studies Methods *	3
Science Process for Teachers *	3	Science Methods *	3
Classroom Management and Motivation	3	School Participation (Clinical Exp.)	6
Organizing and Directing Instruction *	3	Evaluation of Learning and Teaching	3
Math Methods *	3		
Total	18	Total	18
YEAR FOUR			
The Professional Semester	15	Three Elective Courses	9
Student Teaching (12)		Literature	3
Professional Seminar (3)		Diagnosis of Communication Skills	3
		School and Society	3
Total	15	Total	18

* - Denotes where environmental infusion is recommended.

COURSES IN THE GENERAL EDUCATION COMPONENT

Course Titles	Credit Hours
Biological Science I *	3
Biological Science II *	3
Written Communications I *	3
Written Communications II *	3
National History *	3
National Government *	3
Mathematics: Algebra	3
Philosophy: Introduction to Ethics	3
Art	3
Music	3
Physical Education I	1
Physical Education II	1
Physical Science *	3
Environmental Science *	3
Geography *	3
Sociology *	3
Economics *	3
Math for Elementary Teachers *	3
Fundamentals of Communication *	3
General Psychology *	3
Personal/Environmental Health	3
Science Process for Teachers *	3
Literature	3
Total	65

* - Denotes where environmental infusion is recommended.

COURSES IN THE TEACHER EDUCATION COMPONENT

Course Titles	Credit Hours
The Study of Teaching	3
Reading Methods	3
Children's Literature *	3
Human Growth, Development, and Learning	3
Child Psychology	3
Language Arts Methods *	3
Classroom Management and Motivation	3
Organizing and Directing Instruction *	3
Math Methods *	3
Social Studies Methods *	3
Science Methods *	3
School Participation (Clinical Experience)	6
Evaluation of Learning and Teaching	3
Student Teaching	12
Professional Seminar	3
Diagnosis of Communication Skills	3
School and Society	3
Electives	9
Total	72

* - Denotes where environmental infusion is recommended.

GENERAL EDUCATION COURSE DESCRIPTIONS

Biological Science I and II
[Two Semesters]

The introductory biology courses in the general education component of a teacher education programme should, if at all possible, look somewhat different than the traditional biology course at the college level. Typically, an introductory biology course will place heavy emphasis on biological classification. Although it is not inappropriate for teacher education students to understand the rudiments of classification, the course should not be weighted in this perspective of biology. Instead, the cellular and ecological perspectives should predominate because these contents are much more appropriate for students in a general education sense. The person(s) responsible for establishing this course sequence should always keep in mind that the students who are enrolled will not become professional biologists but, instead, will be teaching general education concepts to youngsters of all ages.

Most certainly, the biology course sequence should be activity oriented. This should be accomplished in a manner that will allow students to become very comfortable with an activity oriented approach to the biological sciences. And, if possible, activities should be planned which will permit preservice teacher to adapt these same activities for use in their own classrooms when they become professionals. Seldom does one see this approach taken at the college level. Yet, if taken, this approach would eventually impact on enormous numbers of elementary students in a very positive manner.

Recommended Course Content for the Biological Science Sequence: Biology as a Science; A Definition of "Life"; The Cell as a Unit of Organization: cell theory, cellular organization, material acquisition, energy transfers, cellular homeostasis. **The Organism as a Unit of Organization:** Material acquisition, energy transfers, transport and circulation, secretion and excretion, the role of nervous systems, behavior and survival potential of behavior, organismic homeostasis. **Reproduction:** the cellular basis of reproduction, genes and heredity, reproductive cycles - plant and animal. **Evolution Theory:** the species and species populations, genetic equilibrium, genetic variation in sexual reproduction, evolutionary change, natural selection, adaptation: mechanisms and consequences, evolution and human interpretations of evolution. **Species Populations and Natural Communities:** biomes/ecosystems, communities defined and illustrated, interacting species populations, energy transfers, food chains, food webs, energy pyramids, materials cycling, entropy, the ecosystem concept, interactions and competition, the niche, limiting factors, succession, modification of environments - man-dominated systems, homeostasis in communities and ecosystems. **The Role of Man in Nature:** man as a maker of ecosystems, the monobiotic ecosystem, the ecological consequences of environmental manipulation, critical environmental issues, applying ecological principles to the solution of issues.

Environmental Goals to be Facilitated: Upon completion of the teacher education programme, the teacher is expected to be able to . . .

1. . . . communicate and apply the major ecological concepts including those focusing on individuals, species populations, communities, ecosystems, biogeochemical cycles, energy production and transfer, interdependence, niche, adaptation, succession, homeostasis, and man as an ecological variable.

2. . . . apply a knowledge of ecological concepts to the analysis of environmental issues and identify important ecological principles involved.

3. . . . apply a knowledge of ecological concepts in predicting the ecological consequences of alternative solutions to environmental problems.

Sample Learner Objectives: Subsequent to the completion of this biology course sequence, the preservice elementary teacher should be able to . . .

1. . . . communicate the ecological implications of a discrete environmental issue, e.g., the ecological consequences of acid rain, the ecological implications of stripmining, how aquatic ecosystems are modified as a function of damming, the ecological ramifications of oil spills that invade oceanic estuaries, etc.

2. . . . predict the successional implications of clearcutting in a particular coniferous forest ecosystem.

3. . . . compare the ecological consequences of two divergent strategies for managing oceanic fisheries.

4. . . . explain why the "species population" is a valid unit of organization in the biosphere.

WRITTEN COMMUNICATION I: FRESHMAN COMPOSITION

This is the first written communication course. There are two components to this course, critical reading and analytical writing. To develop these skills, the preservice teacher will read and analyze, both in class discussions and in writing, various essays, short fictional works, and poems. The reading component will develop skills in reading analytically and interpretatively, and will cover various genres and themes in literature. The composition component of the course will cover prewriting, editing and copy-editing.

The importance of this course is obvious in the development of astute consumers of the written word. As preservice teachers assume the role of involved and responsible citizens, they must be able to analyze information, make judgments regarding its validity, and infer the ecological and socio-cultural implications of its messages. Similarly, as educators, they must guide learners in the attainment of those same abilities. This course initiates the development of such an individual.

Recommended Course Content: **I. Composition:** **Prewriting:** Selecting and narrowing a topic, exploring a subject, generating and gathering information, forming tentative theses, outlining. **Writing:** methods of development, developmental paragraphs, introductory/concluding transitional paragraphs, sentences. **Editing:** Sentence combining, selection of appropriate diction. **Copy Editing:** Removing errors of grammar, punctuation, spelling, typing. **Product:** At least two compositions produced which focus on environmental themes. **II. Reading: Paraphrasing and Summarizing:** Restating the author's message, identifying main ideas. **Analyzing for Validity:** Locating supporting arguments, distinguishing between logical and emotional arguments, distinguishing between valid information and propaganda. **Evaluating Information:** Identifying underlying value assumptions, compar-

ing conflicting information for value assumptions. **Example Essays:** Hardin's Tragedy of the Commons, Leopold's Sand County Almanac, Carson's Silent Spring, Allen's Our Wildlife Legacy (Chapter I) Hays' Conservation and the Gospel of Efficiency, Abbey's Desert Solitaire. Poetry and short stories with environmental themes should be selected from the national literary heritage of the teacher education institution.

EE Goals to be Facilitated: Upon completion of the teacher education programme, the teacher is expected to be able to . . .

5. . . . understand and communicate how man's cultural activities (e.g., religious, economic, political, social and others) influence the environment from an ecological perspective.

6. . . . understand and communicate how an individual's behaviors impact on the environment from an ecological perspective.

10. . . . understand the roles played by differing human beliefs and values in environmental issues and the need for personal values clarification as an important part of environmental decision making.

11. . . . understand the need for responsible citizenship action in the solution of environmental issues.

Sample Learner Objectives: Subsequent to the completion of this communications course, the preservice teacher should be able to. . .

1. . . . select from the literature an example of an individual's interaction with the environment, and identify the motivation (beliefs and values) behind that individual's actions.

2. . . . - given a selection of readings with environmental themes - analyze those writings with respect to their ecological, social and cultural implications.

3. . . . select an environmental issue of personal concern, identify various values and beliefs held by individuals and/or groups involved in the issue, describe a position consistent with personal beliefs and values, and defend that position in an essay.

WRITTEN COMMUNICATION II: EXPOSITORY WRITING

This course is a sequel to the first communications course (Freshman Composition) and aims to develop and enhance the preservice teacher's skills in expository writing. Library skills are developed and applied in the production of a documented thesis paper as students are required to locate and utilize information from secondary sources in the investigation of an environmental issue. This course builds on the reading and composition skills developed in the previous course and is critically important in the formulation of citizens who can retrieve and process requisite information for sound decision making in the environmental dimension.

This course is likewise designed to reinforce student skills in reading literature and in literary criticism. Various literary genres are explored.

Recommended Course Content: **Research Procedures. Utilizing Secondary Sources of Information. Summary of Evidence. Sample Research Paper. Writing Proposals. Documentation: Bibliography Cards. Rough Draft. Sample Literary Works Selected from Both the National and World Literary Heritage.**

Environmental Goals to be Facilitated: Upon completion of the teacher education programme, the teacher is expected to be able to . . .

5. . . . understand and communicate how man's cultural activities (e.g., religious, economic, political, social and others) influence the environment from an ecological perspective.

6. . . . understand and communicate how an individual's behaviors impact on the environment from an ecological perspective.

12. . . . apply the knowledge and skills needed to identify and investigate issues (using both primary and secondary sources of information) and synthesize the data gathered.

16. . . . demonstrate the ability to identify and clarify personal value positions related to important environmental issues and their associated solutions.

Sample Learner Objectives: Subsequent to the completion of this communications course, preservice teachers should be able to:

1. . . . write an essay tracing the historical evolution of man's relationship with the environment.

2. . . . select an environmental issue, locate no less than 10 secondary sources of information related to that issue using the Reader's Guide to Periodic Literature, the card catalog, and/or computerized data systems, and generate a bibliography of those references which utilizes correct bibliographic form.

3. . . . select an environmental issue of personal concern, and conduct a thorough investigation of that issue using both primary and secondary sources of information.

NATIONAL HISTORY

Integral to the development of a sound general education of preservice elementary teachers is a working knowledge of their country's history. This national history course includes a focus on those developments of the country's historical experience that have had the most influence in shaping the environment in which the students live. In this course, students will examine the historical roots of social, economic, and political conditions surrounding current national life.

The following course description uses the U.S.A. experience as an example.

Recommended Course Content: **The Formative Years:** emergence of distinctive American values and institutions. **The Establishment of the Nation:** revolutionary origins, emergence of the two-party system, threats to the new nation. **The Nation Under Stress:** growth of the economy, rise of nationalism, democratization of society, civil war. **The Economic Transformation of American Society:** Industrialization, the impact of industrialization on the environment, role of entrepreneurship, emergence of racial segregation, struggle of women for equality, the impact of immigration. **The Growth of National Government:** Rise of political consciousness, growth of the environmental movement, the regulatory role of national government and the impact of the free enterprise system. **Emergence of America as a World Power:** Presence of America in world affairs from WW II to the present, response of the American economy to foreign developments, relationship of the American economy and the military-industrial complex, tensions in American life produced by rising expectations of Americans in a world of diminishing resources and expanding populations.

EE Goals to be Facilitated: Upon completion of the teacher education programme, the teacher is expected to be able to . . .

5. . . . understand and communicate how man's cultural activities (e.g., religious, economic, political, social and others) influence the environment from an ecological perspective.

7. . . . identify a wide variety of local, regional, national and international environmental issues and the ecological and cultural implications of these issues.

10. . . . understand the roles played by differing human beliefs and values in environmental issues and the need for personal values clarification as an important part of environmental decision making.

13. . . . demonstrate the ability to analyze environmental issues and the associated value perspectives with respect to their ecological and cultural implications.

16. . . . demonstrate the ability to identify and clarify positions related to important environmental issues and their associated solutions.

Sample Learner Objectives: Subsequent to the completion of this course, the preservice elementary teacher will be expected to be able to . . .

1. . . . identify the industrial and commercial forces of the past which have contributed to present day environmental concerns.

2. . . . describe the impact of specific human behaviors on the environment as the nation moved from a rural, agrarian society into an urban, industrialized society.

3. . . . select three discrete periods in national history and compare and contrast between the energy resources utilized within each period, and between the relative impacts on the environment which resulted.

4. . . . - given a list of important political figures from the past (e.g., Teddy Roosevelt, James Watt, Gifford Pinchot) - identify the salient beliefs and values of each, and describe the environmental consequences of their decision making.

[Note: As was noted earlier, the preceding course description uses U.S.A. course content as a description. Similarly, the sample learner objectives seen above are those appropriate for use in the United States and not necessarily in other nations.]

NATIONAL GOVERNMENT

This course is designed to develop a better understanding of the foundations and operations of the national political system. The general education of a preservice teacher entails an articulation of the historical, cultural, geographic, and philosophical foundations of the political system and its implications for the individual citizen. Included within this course is a focus on laws, governmental pronouncements and activities affecting the environment.

The following course description pertains to the U. S. national government as an illustrative example.

Recommended Course Content: **Part I:** An overview of the U. S. political system, constitutional democracy, constitutional framework, federalism, and constitutional change. **Part II:** public opinion, interest groups, political attitudes, party politics, electoral process and voting behavior. **Part III:** Congress and the legislative process, the presidency and executive branch, the bureaucracy, foreign policy, and national security. **Part IV:** Judicial system, judicial policy making, civil liberties, and civil rights.

EE Goals to be Facilitated: Upon completion of the teacher education programme, the teacher is expected to be able to . . .

5. . . . understand and communicate how man's cultural activities (e.g., religious, economic, political, social and others) influence the environment from an ecological perspective.

7. . . . identify a wide variety of local, regional, national and international environmental issues and the ecological and cultural implications of these issues.

8. . . .identify and communicate the viable alternative solutions available for remediating crucial environmental issues as well as the ecological and cultural implications of these various solutions.

15. . . . demonstrate the ability to evaluate alternative solutions and associated value perspectives for important issues with respect to their ecological and cultural implications.

18. . . . demonstrate a competence with a variety of citizenship action skills from the following categories of skills: persuasion, consumerism, political action, legal action, and ecomanagement.

20. . . . demonstrate the ability to apply one or more citizenship action skills for the purpose of resolving or helping to resolve one or more environmental issues.

Sample Learner Objectives: Subsequent to the completion of this course, the preservice elementary teacher will be expected to be able to . . .

1. . . . choose an existing environmental law and produce a case history of its development, with attention being given to the legal, political and social forces which shaped it.

2. . . . - subsequent to a thorough investigation into an environmental issue of local concern - formulate a proposal for its remediation, and participate at the local governmental level in helping to bring about its resolution (or partial resolution).

3. . . . select a candidate for public office and analyze his/her platform and/or previous voting record to determine that politician's general voting posture on environmental concerns.

4. . . . - after studying an environmental issue of regional concern - write a letter to a politician, describing your position on the issue and its resolution.

MATHEMATICS: ALGEBRA

This course is designed to increase the algebraic manipulative skills of the student. Preservice elementary teachers are introduced to linear equations, fractional expressions, and other algebraic concepts.

Recommended Course Content: Usually taken during the first semester of the Freshman year, algebra covers the study of linear equations, systems of equations, graphs, polynomials, fractional expressions and equations, quadratic equations and functions, inequalities, exponents, powers, and roots.

[Note: Because the content of algebra denotes no direct linkage with the goals being used in this document, no listing of EE goals appears here. Similarly, no learner objectives are included. However, it is possible for instructors to produce learner objectives which are related to EE for specific instructional circumstances. Therefore, this omission should not preclude an environmental infusion where circumstances warrant.]

PHILOSOPHY: INTRODUCTION TO ETHICS

Philosophy is a recognized component of a liberal education. Since education, itself, is a moral enterprise, a course in the theory of ethics should contribute to the general education of preservice elementary teachers. The goal for this course is for students to clarify ideas about morality and at the same time to gain a basic orientation in a very important part of the history of ideas. In consonance with the overall environmentalized curriculum, environmental philosophy should contribute a very special part of this course. Ethical problems emerging from the interaction of humans with their environment and notions of ethical responsibility will be explored.

Recommended Course Content: **Nature of Philosophy:** metaphysics, epistemology, axiology. **Theories of Morality:** right and wrong conduct, values or ideals, virtues (human excellence), place of reason in ethics, applied ethics, basis of morality. **Environ-**

mental Problems: the nature of environmental problems, the nature of environmental issues, the role of human beliefs and values in issues. **Concerns of Environmental Philosophy:** ethical problems, justification of actions directed towards the environment, notions of responsibility, duty, obligations and rights of future generations. **Religious and Cultural Influences in Environmental Philosophies:** a comparison of diverse religions and cultural perspectives of the human relationship with the environment.

EE Goals to be Facilitated: Upon completion of the teacher education programme, the teacher is expected to be able to . . .

10. . . . understand the roles played by differing human beliefs and values in environmental issues and the need for personal values clarification as an important part of environmental decision making.

11. . . . understand the need for responsible citizenship action in the solution of environmental issues.

Sample Learner Objectives: Subsequent to the completion of this course, the preservice teacher should be able to . . .

1. . . . identify an interaction between humans and their environment which has resulted in an environmental issue and communicate the ethical justifications offered by those involved in the issue.

2. . . . write a personal environmental ethic statement which includes a justification for it.

3. . . . select an environmental issue of international concern, identify the beliefs and values evidenced by nations involved in the issue, and explore the ethical ramifications of each nation's stand on the issue.

4. . . . explore the interactions between humans and other life forms with respect to obligations to present and future human generations.

ART FOR TEACHERS

This course will enable the preservice elementary teacher to explore the various aspects of the visual arts, their relation to human life and society, and the various instructional approaches to art education. Hopefully, the preservice elementary teacher will be exposed to the complexity and richness of art as it has been experienced historically, and as it can be experienced by the individual.

Recommended Course Content: **Significance of Art for Humans:** aesthetics and symbolism, portrayal of events (including environmental topics). **Physical Nature of Art:** line, color, space, etc. **Media Used in Artistic Production:** painting, sculpture, drawing, and others. **Uses and Application of Art Media.** **Approaches to Art Education:** teaching artistic awareness, concept development, creative expression, appreciation, art judgment, and knowledge of cultural history associated with art. **History of Art:** emphasis on national art works as well as world masterpieces.

[Note: This course does not easily lend itself to the infusion of the EE goals used in this document. It could prove influential, however, in the development of environmental sensitivity, "a set of characteristics which result in an individual viewing the environment from an empathetic perspective" (see Part I of this document for a discussion of environmental sensitivity). The art instructor is urged to utilize, wherever possible, artistic works which evoke positive feelings toward the environment, to discuss the aesthetic value of wilderness and other natural areas, and to address the value of those "refuges" for the human spirit. Artists whose works could be used for this kind of activity include John J. Audubon, Ansel Adams, Larry Toschik, David Maas, Don Whitlatch, Ralph McDonald, Ray Harm, Robert Bateman, and Robert Woods.]

MUSIC FOR TEACHERS

This course is designed to equip the preservice elementary teacher with perceptual skills necessary to become a more intelligent music listener and to promote the same among future students. Covering both music appreciation and methods of teaching, attention is given to representative national and world music.

Recommended Course Content: **Significance of Music for Humans:** Aesthetics and symbolism, portrayal of events (including environmental topics). **Rudiments of Music for Non-Music Majors:** melody, harmony, texture, rhythm, dynamics, timbre. **Survey of Characteristic Form and Styles of Music. Examples from Leading Composers of Each Era:** classic and modern. **Approaches to the Teaching of Music in the Elementary School:** musical awareness, creative expression, appreciation, musical judgment, knowledge of our musical heritage.

[Note: This course is one which does not easily lend itself to the infusion of the EE goals used in this document. It could prove influential, however, in the development of environmental sensitivity (see Part I of this document for a complete discussion of sensitivity). The music instructor is urged to utilize the analysis, interpretation, and discussion of works which evoke positive feelings toward the environment. Examples of such works include Beethoven's "The Pastoral Symphony", Grofe's "The Grand Canyon Suite", Vivaldi's "The Four Seasons", John Denver's "Calypso", and John Prine's "Paradise".]

PHYSICAL EDUCATION I: FITNESS

This course is designed to help the preservice teacher understand the whys and hows of physical conditioning. Physical fitness contributes to the general well-being of the student and is enhanced through a combination of (a) lecture on basic physical conditioning and testing, and (b) engaging in various physical activities. In reference to the latter, students are encouraged to engage in physical activities of personal interest.

Recommended Course Content: **Introduction:** Goals and objectives of physical education. **Physical Fitness:** Human physiology, cardiovascular fitness, nutrition and

weight control, aerobic exercise, flexibility, strength/muscular endurance. **Activities:** racquetball, handball, tennis, jogging, walking, basketball, badminton, volleyball, soccer, track and field, field hockey, water polo, archery, other physical activities of interest.

[Note: Because the content of a physical fitness course denotes no direct linkage with the goals being used in this document, no listing of EE goals appears here. Similarly, no learning objectives are included. However, it may be possible for instructors to produce learner objectives which are related to EE for specific instructional circumstances. Thus, the omission of goals and objectives here should not preclude an environmental infusion where circumstances warrant.]

PHYSICAL EDUCATION II: FIRST AID, CPR, AND SAFETY

A sequel to the first physical education course, this course is designed to train the preservice teacher in the techniques of cardiopulmonary resuscitation and first aid. These topics as well as safety habits are studied with special emphasis on elementary school-age children, and classroom and school settings.

Recommended Course Content: **Introduction:** The need for safety and first aid training. **First Aid:** Principles, varied practices/techniques. **Cardiopulmonary Resuscitation:** When to use it, principles, varied practices/techniques. **Safety:** Ways of promoting safety, establishing safety rules. **Practicum:** Students practice first aid and CPR techniques. Demonstrating the mastery of those techniques can lead to Red Cross certification.

[Note: Because the content of a physical education course denotes no direct linkage with the goals being used in this document, no listing of EE goals appears here. Similarly, no learning objectives are included. However, it may be possible for instructors to produce learner objectives which are related to EE for specific instructional circumstances. Thus, the omission of goals and objectives here should not preclude an environmental infusion where circumstances warrant.]

PHYSICAL SCIENCE

This course is an introduction to the broad range of physical sciences which contributes to the general education of the preservice elementary teacher. Much of human daily activity is governed by the physical laws of nature, and a thorough grasp of the concepts, laws, and principles of the physical sciences will assist the preservice teacher in understanding the natural world. Similarly, this foundational knowledge is prerequisite to the effective teaching of the physical sciences to youngsters.

An important feature of this course is its environmental and practical applications. Since it is process-oriented, it includes a laboratory component in which the students conduct physical science investigations with attendant environmental and practical ramifications. In addition

to the traditional topics usually included in a physical science course, this course addresses environmental chemistry, environmental geology, and nuclear science and the environment.

Recommended Course Content: **Physics:** Motion, energy, electricity, magnetism and electric power, electromagnetic waves, sound, astronomy (the solar system, stars, space, and time). **Chemistry:** Matter, solids, liquids and gases, chemical change, environmental chemistry (including the chemistry of both air and water pollution). **Nuclear Sciences and the Environment:** Radioactivity, nuclear fission, environmental problems associated with nuclear energy. **Geology:** Atmosphere, weather, lithosphere, the rock cycle, weathering and erosion, evolution of landscapes, soils, issues in environmental geology.

EE Goals to be Facilitated: Upon completion of the teacher education programme, the teacher is expected to be able to...

5. ... understand and communicate how man's cultural activities (e.g., religious, economic, political, social and others) influence the environmental from an ecological perspective.

7. ... identify a wide variety of local, regional, national and international environmental issues and the ecological and cultural implications of these issues.

8. ... identify and communicate the viable alternative solutions available for remediating crucial environmental issues as well as the ecological and cultural implications of these various solutions.

13. ... demonstrate the ability to analyze environmental issues and the associated value perspectives with respect to their ecological and cultural implications.

15. ... demonstrate the ability to evaluate alternative solutions and associated value perspectives for important issues with respect to their ecological and cultural implications.

19. ... evaluate selected actions in light of their ecological and cultural implications.

Sample Learner Objectives: Subsequent to the completion of this course, the pre-service elementary teacher should be able to...

1. ... select an issue associated with environmental chemistry, identify the chemical nature of this issue, and describe the environmental impact of this issue.

2. ... identify at least three environmental problems associated with the applied technology of nuclear fission and demonstrate an understanding of the impact or potential impact of these problems on human populations.

3. ... communicate the relationships that exist between the natural processes of weathering and erosion and agricultural practices which lead to the rapid loss of valuable agricultural land.

ENVIRONMENTAL SCIENCE

In the preparation of elementary teachers who are capable of teaching environmental education, there is probably not one general education course more important than basic environmental science. In addition, such a course has very real general education value, making it almost as appropriate for all collegiate undergraduates as it is for the preservice teacher education programme. By its very nature it is highly interdisciplinary, integrating content from the social studies, biological sciences, physical sciences, and earth sciences. In addition, it has great potential for infusing language arts if the instructor utilizes meaningful activities centered around debate, panel discussions, and report writing.

The content of an environmental science course should probably be weighted for issues which are of significant importance both regionally and internationally. It is very important for the preservice teacher to have a holistic view of the environment from an issues perspective. If this is not accomplished, the classroom teacher may focus on issues which have interest and local importance only without helping children understand the global nature of the numerous environmental crises facing mankind.

It appears extremely important for the environmental science course to have at least the courses in the biological sciences as prerequisites. Doing so should guarantee that the preservice teachers come to environmental science with a reservoir of ecological concepts at their disposal. These concepts are, of course, foundational to a thorough understanding of issues.

Recommended Course Content: A Review of Critical Ecological Concepts; The Global Nature of Environmental Issues: the phenomenon called "entropy", an introductory overview of critical global issues including: population, land use management, world hunger, energy resources, rain forest management, water resources, pollution, and wildlife management. **Population:** population dynamics, relationships between population, pollution, resource use, technology, and health; the concept of as sustainable world population, human population control, variables conflicting with population control, critical issues to be resolved. **Land Use Management:** land use in developed and developing nations, the role of parks, wilderness, and wildlife refuges; urbanization and urban growth, zoning, problems in the urban environment, strip mining and reclamation, the relationships between population and land use management. **World Hunger:** the relationships between food supplies and world hunger, relationships between population size and hunger, problems associated with various agricultural systems, benefits of various agricultural systems, problems associated with cultivating more land and increasing crop yields, problems associated with pesticide usage, the critical nature of soil erosion, the limits to sustainable fisheries. **Energy Resources:** types of energy resources, how man has applied various energy resources, benefits and problems associated with technology and energy production, the limits to fossil fuels, alternatives to fossil fuels and attendant problems, the role of solar energy in all its forms, developing a regional and global energy plan. **The Tropical Rain Forest:** distribution, ecological impact of the rain forest, economics of preservation vs development, the rain forest as species habitat, development and extinction, management problems and the potential for resolving these problems. **Water Resources:** worldwide supply, distribution and use of water, issues associated with water including soil salinization, use of fossil water supplies, water diversion, surface water pollution, groundwater pollution, and dams. **Air and Noise Pollution:** types of pollution, effects of smog and other forms of air pollution, acid rain and its consequences, noise and its effects on human beings, regional issues associated with air and noise pollution. **Wildlife Management:** the ecological role and benefits of wildlife, endangered species, habitat destruction, over-utilization, extinction, the need for preserving gene pools, feral animal problems, protection and management of game and nongame species, regional issues associated with wildlife

(including fisheries management). **Economics, Politics, and Environmental Ethics:** national and international costs associated with environmental degradation, costs of resolving problems/issues, future costs if improvements are not made, the role of politics in environmental decision-making, using the political process for initiating change, components of an environmental ethic, the need for appropriate life styles, influencing change at the local/regional levels.

Environmental Goals to be Facilitated: Upon completion of the teacher education programme, the teacher is expected to be able to . . .

2. . . . apply a knowledge of ecological concepts to the analysis of environmental issues and identify important ecological principles involved.

3. . . . apply a knowledge of ecological concepts in predicting the ecological consequence of alternative solutions to environmental problems.

5. . . . understand and communicate how man's cultural activities (e.g., religious, economic, political, social, etc.) influence the environment from an ecological perspective.

6. . . . understand and communicate how an individual's behaviors impact on the environment from an ecological perspective.

7. . . . identify a wide variety of local, regional, national and international environmental issues and the ecological implications of these issues.

8. . . . identify and communicate the viable alternative solutions available for remediating crucial environmental issues as well as the ecological and cultural implications of these various solutions.

11. . . . understand the need for responsible citizenship action in the solution of environmental issues.

Sample Learner Objectives: Subsequent to the completion of this course, the pre-service elementary teacher should be able to . . .

1. . . . describe the relationship that exists between the loss of tropical rain forests and species extinction.

2. . . . cite one example of man's depletion of a fossil water supply and the agricultural implications of this depletion.

3. . . . describe specific examples of the impact that feral horse and burro populations have had on western U.S. ecosystems. [This objective or a similar one can be used to evaluate students' knowledge of the impact any feral population has had/is having on a given man-made or naturally existing ecosystem.]

4. . . . compare and contrast, in ecological terms, monobiotic agricultural ecosystems with the more complex, naturally existing ecosystems. Emphasis should be given to species diversity, long-term stability, resistance to external variables, and biogeochemical cycling.

5. . . . - using a variety of secondary sources - evaluate the degree to which solar energy applications have decreased U.S. dependence on fossil fuels, e.g., coal, gas, and oil.

PRINCIPLES OF GEOGRAPHY

This course attempts to help students analyze and understand interactions between people and their physical, political, and economic environments, and forms a bridge between the natural and social sciences. This integrative approach is designed to assist in providing a general education for preservice teachers.

As a survey of the geography of human activity, emphasis is placed upon current problems related to resources, population, regional development, urbanization, wealth, and power. Students explore local, regional, and global environmental issues in a geographic context and suggest ways of resolving these issues. This course, therefore, has a natural linkage to the study of environmental problems and the development of responsible environmental behavior.

Recommended Course Content: **Introduction**: geography and human geography, methods of research in geography, maps, themes, and critical topics. **Population**: world population growth/density, policies, implications for "spaceship earth". **Nutrition and Health**: regional health crises, the impact of natural hazards, health services delivery systems as related to geography, the transmission of disease. **Mobility and Migration**: the structure and process of human population movements. **Culture and Landscape**: cultural geography, race and culture, cultural expression in regional landscapes. **Language and Religion**: the geography of language, geography of religion. **Economic Geography**: changing cultivation patterns, subsistence farming, location of critical resources/raw materials and the economic impact of resource geography. **Industrialization and Economic Development**: the industrial revolution/industrial intensification. **Settlement Geography and the Growth of Urbanization**: settlements viewed in a spatial perspective. **Urban Structure and Process**: urban sites and situations, hierarchy, centrality, central place theory. **Political Geography**: spatial manifestations of political behavior. **Global Problems and Geographic Perspectives**: natural resources and environments, cultural ecology, world political stability.

Environmental Goals to be Facilitated: Upon completion of the teacher education programme, the teacher is expected to be able to . . .

5. . . . understand and communicate how man's cultural activities (e.g., religious, economic, political, social and others) influence the environment from an ecological perspective.

13. . . . demonstrate the ability to analyze environmental issues and the associated value perspectives with respect to their ecological and cultural implications.

15. . . . demonstrate the ability to evaluate alternative solutions and associated value perspectives for important issues with respect to their ecological and cultural implications.

16. . . . demonstrate the ability to identify and clarify personal value positions related to important environmental issues and their associated solutions.

Sample Learner Objectives: Subsequent to the completion of this course, the preservice teacher should be able to . . .

1. . . . communicate the relationship that exists between the geography of language and culture and an individual's attitude toward the environment.

2. . . . analyze human management practices (e.g., shifting agricultural practices, deforest-

ation, land use management, fisheries management) with respect to their relationship to economic geography (i.e., human economic activity worldwide).

3. . . . communicate the relationship between industrialization (including economic development and resource utilization) and the rise of specific environmental issues (e.g., resource management problems, nuclear waste disposal, air and water pollution, etc.).

4. . . . compare the growth of urban development with the rise of environmental issues (e.g., loss of agricultural land, destruction of natural habitat/ecosystems, loss of recreational resources, etc.).

5. . . . identify several global environmental issues and evaluate solutions to these issues with respect to their impact on cultural institutions and ecological stability.

INTRODUCTION TO SOCIOLOGY

As a component of general education, sociology is designed to help the preservice elementary teacher learn about self in a social context as well about social institutions and problems. This introductory course acquaints the student with the basic theories, the major scholars, the methodologies, and the various branches and sub-fields of this discipline.

Special emphasis is given to a sub-field, the sociology of science. The consequences of modern science and technology for society will be explored. Discussion will focus on public policy, politics, the country's socio-cultural and economic status in relation to science/technology and their impact on environmental quality.

Recommended Course Content: **Introduction:** Basic theories, branches and sub-fields. **Research Methods:** principles of scientific methods with reference to selected contemporary problems in sociology. **Basic Concepts:** social organization, culture, socialization, social groups, social stratification, collective behavior, social pathology, population and human ecology. **Sociology of Science:** science-related social issues (e.g., genetic manipulation, sexually transmitted diseases, toxic waste disposal, fetal research, etc.), the relationship of science/technology to education, religion, corporate enterprise, and national security. **Sociology of Environmental Movements:** public opinion, organizations, institutions, and communications. **Social Pathology:** social pathology defined, crime, poverty, drugs and alcoholism, prostitution, the impacts of selected population densities. **Readings:** Works by Robert Merton, Alfred North Whitehead, Thomas Kuhn, Albert Einstein, C.P. Snow, Gerald Holton, etc.

EE Goals to be Facilitated: Upon completion of the teacher education programme, the teacher is expected to be able to . . .

5. . . . understand and communicate how man's cultural activities (e.g., religious, economic, political, social and others) influence the environment from an ecological perspective.

7. . . . identify a wide variety of local, regional, national and international environmental issues and the ecological and cultural implications of these issues.

13. . . . demonstrate the ability to analyze environmental issues and the associated value perspectives with respect to their ecological and cultural implications.

15. . . . demonstrate the ability to evaluate alternative solutions and associated value perspectives for important issues with respect to their ecological and cultural implications.

17. . . . demonstrate the ability to evaluate, clarify, and change value positions in light of new information.

Sample Learner Objectives: Subsequent to the completion of this course, the preservice teacher should be able to . . .

1. . . . describe the social forces (e.g., religious, economic, political) which influence population growth or stability in the student's own nation.

2. . . . select an environmental issue of personal concern and prepare a written report which communicates the human social activities which influence the issue, describe a possible solution to the issue, and explain how that solution will impact human social institutions and behavior.

3. . . . participate in a simulation which thoroughly explores an environmental issue (e.g., human population growth, food production and distribution, the urbanization of prime farmland). Prior to the simulation, the student will generate a written statement which explains his/her stand on the issue. After selecting (or being assigned) a role, the student will conduct appropriate research and defend that role during the simulation. Subsequent to the simulation and related class discussion, the student will provide a written synthesis of the alternative positions which impinge upon the issue.

PRINCIPLES OF ECONOMICS

A basic understanding of the nature of economics and economic activity is essential to the general education of prospective elementary teachers. These preservice teachers should be able to relate the principles of economics to the operation of their country's economy. Similarly, they should be able to recognize the major influences of economic considerations in environmental issues. Both micro-economic and macro-economic principles are discussed in relation to the functioning of the major economic institutions and sectors of the economy. Where feasible, attempts should be made to relate basic economic concepts to environmental quality. The macro-economic issue of economic development is treated in light of domestic and international trade as well as in the context of the local and global environments.

Recommended Course Content: **Scarcity and the Economic System:** examining the economic way of thinking about people's behavior in an environment of scarce resources. Emphasis is placed on the interaction between theory and practical observation. **Basic Micro-Economic Concepts:** organization of production, the distribution of income, the role of markets for labor and capital, analysis of resource allocation and income distribution. **Macro-Economic Concepts:** the workings of the economy as a whole are analyzed with emphasis placed on unemployment and inflation. Alternative government approaches are explored. Economic interaction between individual countries and the rest of the world, balance of payments, exchange rate policy, foreign investment, and the longer term macro-economic issue of economic development are discussed. **Ecological Consequences of Economic Development.**

Environmental Goals to be Facilitated: Upon completion of the teacher education programme, the teacher is expected to be able to . . .

5. . . . understand and communicate how man's cultural activities (e.g., religious, economic, political, social and others) influence the environment from an ecological perspective.

8. . . . identify and communicate the viable alternative solutions available for remediating crucial environmental issues as well as the ecological and cultural implications of these issues.

13. . . . demonstrate the ability to analyze environmental issues and the associated value perspectives with respect to their ecological and cultural implications.

Sample Learner Objectives: Subsequent to the completion of this course, the preservice elementary teacher should be able to . . .

1. . . . describe how man's economic activities influence the environment, citing specific examples.

2. . . . examine and communicate how man's economic way of thinking affects his behavior in an environment with increasingly scarce resources.

3. . . . cite specific economic functions of government (e.g., price stabilization, maintaining competition, the redistribution of income, the management of economically important and scarce resources) and relate these to specific environmental issues, providing examples of issues as well as governmental responses to these issues.

4. . . . apply the principles of both urban and rural economics to an analysis of environmental issues, utilizing at least some of the following practices in the analysis: zoning, agricultural practices, transportation, waste disposal, and energy use.

5. . . . identify specific environmentally-related governmental policies which have important economic implications. Further, be able to determine and communicate whether these policies are ecologically sound.

MATHEMATICS FOR ELEMENTARY SCHOOL TEACHERS

This is a content oriented - not a methods oriented - course in mathematics for preservice elementary teachers. The course covers a study of mathematics topics the elementary teacher is likely to teach, with an emphasis placed on problem solving.

Manipulatives and other hands-on activities are emphasized for a better understanding of mathematical concepts. The use of computers is integrated in different topics throughout the course. Attempts should be made to infuse environmental concepts in problem-solving situations.

Recommended Course Content: **The Nature of Mathematics:** introduction to problem solving, patterns, inductive/deductive reasoning, conjecture, sequence, and problem solving strategies. **Sets and Relations:** operations and functions. **Numeration Systems and Whole Numbers:** addition and subtraction algorithms, multiplication and division algorithms, number bases. **Integers:** operations, solving equations and inequalities. **Number Theory:** divisibility, prime/composite numbers, greatest common divisor, least common multiple, clock modular arithmetic. **Rational Numbers - Fractions:** operations, properties, exponents. **probability and Statistics:** odd and mathematical expectations, counting

methods, statistical graphs, measures of central tendency. **Informal Geometry:** basic notions, plane figures, angles, networks, congruence, symmetry. **Measurement:** metric system, areas, volume, mass, temperature. **Coordinate Geometry:** coordinate system in a plane, equations of lines, distance and midpoint formulas. **Using the Computer to Solve Problems.**

Environmental Goal to be Facilitated: Upon completion of the teacher education programme, the teacher is expected to be able to . . .

12. . . . apply the knowledge and skills needed to identify and investigate issues (using both primary and secondary sources of information) and synthesize the data gathered.

Sample Learner Objectives: Subsequent to the completion of this course, the pre-service elementary teacher should be able to . . .

1. . . . apply the concepts of probability and statistics in projecting population numbers, natural resource utilization, and other environmental content.

2. . . . solve word problems that involve pertinent environmental data, e.g., calculating the numbers of individuals resulting from three (3) generations of two-child families versus three-child families.

3. . . . construct and correctly interpret both bar and coordinate graphs depicting pertinent environmental data.

FUNDAMENTALS OF COMMUNICATION

Communication is a critically important tool in the general education of all college students. Its role in the preparation of preservice elementary teachers cannot be ignored. Students are therefore exposed to the basic principles of communication and given training in interpersonal communication skills, in small group dynamics, and in public communication.

Communication concepts are explained through examples drawn from actual experiences. The tools of gathering information through primary and secondary sources are mastered. Likewise, students are trained in the process of interviewing, group dynamics, and responsible leadership. Students learn to carry on research prior to public speaking as well as how to construct and deliver a speech. Although students are relatively free in the selection of speech topics, they are familiarized with environmental issues, given opportunity to clarify their values, to make value decisions, and to take environmental action in the form of informative and persuasive speeches.

Recommended Course Content: **Basic Principles of Communication:** the need for communication skills, elements of communication, interpersonal communication, perception and self-concept, the listening process, verbal and nonverbal communication. **Interpersonal Communication:** interpersonal needs, self-disclosure, relationship stages, models for conflict resolution, the interviewing process. **Small Group Dynamics:** characteristics of small groups, group vs individual in problem resolution, group strategies, leader and participant responsibilities, leadership styles. **Public Communication:** topic selection, use of personal experience, interviews, library research, organizing and outlining the speech, speech delivery, informative speech, persuasive speech, debate.

Environmental Goals to be Facilitated: Upon completion of the teacher education programme, the teacher is expected to be able to . . .

12. . . . apply the knowledge and skills needed to identify and investigate issues (using both primary and secondary sources of information) and synthesize the data gathered.

13. . . . demonstrate the ability to analyze environmental issues and the associated value perspectives with respect to their ecological and cultural implications.

16. . . . demonstrate the ability to identify and clarify personal value positions related to important environmental issues and their associated solutions.

17. . . . demonstrate the ability to evaluate, clarify, and change value positions in light of new information.

20. . . . demonstrate the ability to apply one or more citizenship action skills for the purpose of resolving or helping to resolve one or more environmental issues.

Sample Learner Objectives: Upon completion of this course, the preservice teacher should be able to . . .

1. . . . identify and investigate environmental issues using both primary and secondary sources of information. Among the skills to be evaluated would be: (a) the ability to effectively use the interview process of gathering information about an environmental issue, and (b) the ability to conduct library research on environmental issues in preparation for making an informative/persuasive speech.

2. . . . analyze environmental issues and identify the "players" involved in the issues, the players' beliefs/positions, and their associated value perspectives. Further, the student should be able to communicate and debate the cultural and ecological ramifications of players' beliefs/positions and values.

3. . . . formulate and deliver a persuasive speech on an environmental topic. The speech should clearly describe the student's stand on the issue and should provide logical justification for that stand.

GENERAL PSYCHOLOGY

This course introduces the prospective elementary teacher to the field of psychology. The different components of psychology are presented as they relate to five main questions: how do humans act, how do they know, how do they interact, how do they develop, and how do they differ from each other?

To provide intellectual cohesion, each topic is considered against the backdrop of one or two major ideas that could serve as an organizing and unifying framework. Several major themes cut across the different topics. All involve variations on the twin controversies of nature versus nurture and psychological atomism versus organization.

Recommended Course Content: Introduction to Psychology: looking at psychological phenomena from various perspectives - as mental acts, as overt behavior, as reflections of underlying psychological processes, as social interactions, as manifestations of development.

Action: biological bases for behavior, motivation, learning. This part focuses on overt behavior and its physiological roots. **Cognition:** sensory processes, perception, memory, thinking, language. This section is concerned with what humans know, how they come to know it, and how this knowledge is retrieved from memory, transformed through thinking, and communicated by language. **Social Behavior:** the biological basis for social behavior, social psychology, Freudian psychology. This part deals with behavior as it occurs in a social context, not merely as action but as interaction. The factors that determine social behavior are explored. **Development:** general issues, cognitive development, language acquisition, social development. Freud's theories provide a link to this section on human development. **Individual differences:** the nature and measurement of intelligence, personality assessment, psychopathology. This last section focuses on the ways in which humans differ from each other.

All of these topics are explored from the standpoint of each individual student's behavior so that he/she better understands his/her own behavior and the ways in which it can be modified.

[Note: Because the content of an introductory general psychology course denotes no direct linkage with the goals being used in this document, no listing of EE goals appears here. Similarly, no learning objectives are included. However, it is possible for instructors to produce learner objectives which are related to EE for specific instructional circumstances. For example, instructors familiar with the psychological roots of environmental behavior may wish to focus some attention on this topic with the concurrent use of one or more learner objectives for this application. Thus, the omission of goals and objectives here should not preclude an environmental infusion where circumstances warrant.]

PERSONAL/ENVIRONMENTAL HEALTH

This course enables the preservice elementary teacher to acquire knowledge, skills, and attitudes necessary to develop and maintain healthful living and to explore approaches to teaching health in the elementary grades. Human beliefs and values are emphasized as they relate to personal health habits and environmental health topics.

Recommended Course Content: **Health as a Total Concept. Personal Physical Health:** human physiology, aerobics, cardiovascular fitness, nutrition, weight control, strength and endurance, flexibility, sound health habits and the bases for them. **Mental Health:** psychological concepts, principles of human needs, mental health problems, keys to mental health. **Environmental Health:** environmental variables affecting human health, environmental diseases including birth defects and cancer, toxic substances in the environment including lead, asbestos, mercury and PCBs, the impact of pesticides on man and the environment, food quality, food contaminants, diseases caused by food, atmospheric pollution, acid rain, sources of air pollution and health implications, noise pollution, effects of noise on health, water supply problems, groundwater contamination and associated health problems, sewage disposal and treatment, maintaining quality drinking water, hazardous wastes, solid wastes, resource recovery as a partial solution to solid waste problems, the role of human values in environmental health issues, responsible human behavior and environmental health. **The Need for Environmental Health Education. Methods. Health-Related Careers.**

EE Goals to be Facilitated: Upon completion of the teacher education program, the teacher is expected to be able to . . .

6. . . . understand and communicate how an individual's behaviors impact on the environment from an ecological perspective.

10. . . . understand the roles played by differing human beliefs and values in environmental issues and the need for personal values clarification as an important part of environmental decision making.

11. . . . understand the need for responsible environmental action in the solution of environmental issues.

13. . . . demonstrate the ability to analyze environmental issues and the associated value perspectives with respect to their ecological and cultural implications.

Sample Learner Objectives: Upon completion of this course, the preservice teacher should be able to . . .

1. . . . prepare a synthesis of no less than six salient human behaviors which impinge negatively on environmental health concerns and the consequences of these behaviors.

2. . . . evaluate and communicate the extent of public awareness as a result of various media presentations of environmental health issues and solutions, e.g., effects of smoking in public areas, the attention drawn to the AIDS epidemic in North America, environmental health issues associated with toxic waste disposal.

3. . . . design and administer a survey instrument to assess public beliefs and values relative to a serious environmental health issue. Subsequently, the student will be expected to interpret and communicate the results of the survey.

4. . . . communicate the effects of human population dynamics on serious environmental problems such as air pollution, noise pollution, sewage disposal, water quality, the accumulation of solid and hazardous wastes, use of pesticides, desertification, loss of species populations, etc.

5. . . . describe the health implications of hunger and discuss (both pros and cons) commonly communicated solutions such as: (1) expanding the amount of land being cultivated, (2) obtaining more protein from the sea, (3) reducing the loss of food by improving handling and storage techniques, (4) increasing food yields per acre, and (5) reducing numbers of human beings in order to reduce demand for food.

SCIENCE PROCESS FOR TEACHERS

With the emphasis being placed on science process skills at the elementary school level and with the growing awareness of the need for issue investigation skills, the science process course looms important for the training of elementary teachers. This course attempts to do several things thoroughly: (1) it introduces the student to the science-technology-society (STS) relationships, (2) it provides indepth training in both basic and integrated science process skills, (3) it provides training in issue investigation skills, and (4) it demands the application of both sets of skills by the prospective teacher.

Recommended Course Content: **The Philosophical Basis of empiricism. A Rationale for Instruction in Science Process. Modern Instructional Goals for Science:** meeting personal needs of students, coping with science-related social issues, academic preparation, and awareness of careers in science. **Science Process Skills:** the basic science process skills defined, modelled, and applied (e.g., observing, inferring, classification, measurement, operationally defining), integrated process skills defined, modelled, and applied (e.g., hypothesizing, designing experiments, conducting experiments, recording and interpreting data). **Issue Investigation Skills:** the skills needed for effective issue investigation defined, modelled, and applied (e.g., identifying issues, analyzing issues to identify "players", beliefs and values, writing research questions, using skills associated with data collection via secondary sources, using skills associated with data collection via surveys, questionnaires, and opinionnaires, recording data, interpreting data, drawing conclusions). **Investigating Issues:** the autonomous investigation of a science-related social issue (e.g., an environmental issue), reporting of issue investigation to peers.

EE Goals to be Facilitated: Upon completion of the teacher education programme, the teacher is expected to be able to . . .

9. . . . understand the need for issue investigation and evaluation as prerequisite to sound decision making.

11. . . . understand the need for responsible citizenship action in the solution of environmental issues.

12. . . . apply the knowledge and skills needed to identify and investigate issues (using both primary and secondary sources of information) and synthesize the data gathered.

13. . . . demonstrate the ability to analyze environmental issues and the associated value perspectives with respect to their ecological and cultural implications.

14. . . . demonstrate the ability to identify alternative solutions for important issues and the value perspectives associated with these solutions.

15. . . . demonstrate the ability to evaluate alternative solutions and associated value perspectives for important issues with respect to their ecological and cultural implications.

19. . . . evaluate selected actions in light of their ecological and cultural implications.

Sample Learner Objectives: Subsequent to the completion of this course, the preservice teacher should be able to . . .

1. . . . demonstrate the ability to thoroughly analyze an environmental issue and identify and communicate: (a) the issue itself, (b) the "players", (c) the players' beliefs/positions, and (d) the players' values.

2. . . . demonstrate an ability to autonomously investigate a science-related social issue and expertly communicate that issue to others.

3. . . . communicate the alternative solutions available for solving an environmental issue as well as the value perspectives associated with those solutions.

4. . . . communicate the ecological and cultural implications of the alternative solutions proposed for environmental issues.

5. . . . demonstrate an ability to design and administer a valid questionnaire or opinionnaire.

INTRODUCTION TO LITERATURE

This course focuses on the development of skills which will enable the student to move from a literal to a symbolic understanding of the various literary genres. Similarly, it will nurture and develop an appreciation of literature in a variety of forms. Students are introduced to major forms of literature: poetry, drama, and fiction, and to techniques of critique and analysis. These techniques are applied as the course surveys literary selections from national and world literature (classical and modern).

Recommended Course Content: **Poetry:** forms, theories, techniques, critiques. Sample poems from country/world. Examples: "Stopping by Woods on a Snowy Evening", "Western Wind", "A Road Not Taken", some Japanese haiku. **Drama:** forms, theories, techniques, critiques. Sample drama from country/world. Examples: Shakespeare comedy/tragedy/history, Homer's Iliad, tales from national folklore. **Fiction:** short story, novella, other forms of prose, theories, techniques, critiques. Examples: "The Necklace", "Light in August", "The Tree of Knowledge", "The Great Expectation".

[Note: This course does not easily lend itself to the infusion of the EE goals used in this document. It could prove influential, however, in the development of environmental sensitivity (see Part I of this document for a complete discussion of environmental sensitivity). The literature instructor is urged to utilize the reading, analysis, interpretation and discussion of literary works which evoke positive feelings toward the environment.]

TEACHER EDUCATION COURSE DESCRIPTIONS

THE STUDY OF TEACHING

The introductory course in the professional education component of a teacher education programme should facilitate a structured overview of teaching and learning. Such structure should involve the student of teaching in classroom components (information processing, reflecting, discussing), as well as in experiential components (observing, participating, discussing).

The classroom component should focus on what research says about the knowledge base concerning the four elements of the teaching/learning situation: the teacher, the learner, the content/process, and the context in which these three interact. The experiential component should likewise focus on these same four elements, but from the viewpoint of observing actual classroom practice. Within this framework, an integrated preview of Human Growth, Development and Learning; Classroom Management and Motivation; Organizing and Directing Instruction; Evaluation of Learning and Teaching; and School and Society should be provided.

While both classroom and field components are crucial to facilitating the development of a framework for the study of teaching, this initial course should draw heavily on the experiential in order to facilitate the development of a critical thinking attitude toward teaching and learning.

The major goal for The Study of Teaching, then, is to facilitate the development of students who are both reflective and analytical about their field experiences. This goal is based on the premise that,

> . . . we benefit from our experiences by preparing for and reflecting on them. Preparation opens our eyes to the social and personal backgrounds of the people with whom we work. Reflection enables us to consider the consequences of our actions in light of our past experiences and the ideas derived from our formal study of education. Together, these two activities increase our ability to work in a thoughtful and appropriate manner rather than merely repeating mindlessly the practices of past teachers (Posner, 1985).

Recommended Course Structure: Students would meet weekly in a classroom setting (weeks 1-16) to reflect on and discuss the information gained from their readings and field experiences. These would typically be one hour sessions near the end of the week. Students would also spend one full day per week (weeks 3-15) in a clinical school working with the Clinical Coordinator (CC) and Cooperating Teacher (CT), participating in all of the activities of a typical school day in which the CT participates. In addition to the typical classroom activities planned with the CT, several structured activities must be completed during the field experience. For each of these structured activities, the students will write a daily log in which they record events and personal reactions. The logs provide an opportunity to keep track of events and to reflect privately on the personal and public meaning of these events.

Recommended Structured Field Activities: **Walk Around the School:** Walk around the school, inside and outside; become familiar with the atmosphere of the school in classrooms, library or learning center, cafeteria, playground; note what students do in the halls, types of bulletin boards, condition of the facilities. **Observing and Talking With Students:** What is the composition of the student population? What are the students' attitudes toward school? What do they feel their parents' attitudes are toward the school? **Classroom Map:** Sketch, to scale, the classroom; identify instructional technology available to support instruction; note the usual location of the teacher in the classroom, the usual activities in which the teacher engages, the usual location of students in the classroom, and the usual activities in which the students engage. **Conversation With the Cooperating Teacher:** What student diversity exists in the classroom? What does the community expect of the school? What classroom management strategies are critical to student learning? What are the CT's perspectives and beliefs on teaching? How will the CT and the preservice teacher work together? **Observing Students During Instruction:** What students arrive in the classroom in groups, alone? How do the groups and/or individuals interact? What individuals play key roles in relations among students, with the teacher, in terms of lesson flow? **Teaching a Lesson:** Plan with the CT a specific topic and date for teaching a lesson; complete a preliminary lesson plan and discuss it with the CT; refine and teach; analyze the effectiveness of the lesson. **Observing Other Classes:** Visit other classrooms in the school and note the similarities and differences which exist in relation to the CT's class.

[Note: Because the content of an introductory teaching course denotes no direct application of the EE goals being used in this document, no listing of goals appears here. Similarly, no learning objectives are included. However, it may be possible for instructors to produce learner objectives which are related to EE for specific instructional circumstances, and the reader is encouraged to do so. Thus, the omission of goals and objectives here should not preclude an environmental infusion where circumstances warrant.]

READING METHODS

This course focuses on the teaching of developmental reading in the elementary school and views reading as a holistic and meaningful process. Aspects of corrective reading instruction are also included. An important feature of this course is its emphasis on research findings. A review of pertinent research accompanies the introduction of each main topic and presents findings which are useful in the development of a successful elementary reading programme.

Recommended Course Content: **Introduction**: a framework for understanding and teaching reading. **Approaches to Reading Instruction**: the basal reader approach, the language experience approach, the individualized reading approach, other approaches as deemed necessary. **Organizing and Managing Reading Instruction**: managing a reading programme, organizational plans and grouping strategies, directed reading lessons, discipline. **Reading Readiness**: assessment of reading readiness, teaching reading readiness. **Sight Words and Basic Sight Words**: lists of basic sight words, assessing students' knowledge of sight words, teaching basic sight words. **Decoding Skills**: configuration clues, context clues, phonics, structural analysis, efficiency skills, dictionary skills. **Comprehension and Vocabulary Skills**: assessing comprehension, assessing knowledge of vocabulary, teaching comprehension and vocabulary. **Content Area Reading Instruction and the Study Skills**: reading to learn, teaching reading in the content areas, applying study skills. **Analysis of Oral Reading Errors**: oral reading as diagnosis, a shorthand method of marking oral reading errors, students' oral reading errors and how to correct them, analyzing the meaning of coded reading passages. **Matching Children with Reading Materials. Sustained Silent Reading. Exceptional Students**: teaching the problem reader, teaching the gifted student, teaching the student who speaks a different dialect, mainstreaming. **Reading Instruction - Its History and its Future**: a history of reading instruction, becoming better reading teachers in the future.

[Note: Because the content of a reading methods course denotes no direct linkage with the EE goals used in this document, no listing of EE goals appears here. Similarly, no learning objectives are included. However, the reading skill instruction dealt with in this course is crucial to awareness and investigation skills and it may be possible for instructors to produce learner objectives which are related to EE for specific instructional circumstances. Thus, the omission of goals and objectives here should not preclude an environmental infusion where circumstances warrant.]

CHILDREN'S LITERATURE

The purpose of this course is to provide a survey of children's literature which encourages an awareness of and appreciation for the various genres. The preservice elementary teacher explores a wide range of examples from the past and contemporary scenes and critiques those works following discussion of what constitutes "good" children's literature. Attempts are made to cover various genres and examples are provided for younger, middle, and older age groups.

Literature can be useful in promoting a sensitivity toward the environment and its problems and in providing information on environmental issues. It is certainly to the benefit of

the preservice teacher to become familiar with literary works which are appropriate for those purposes. [Note: Where appropriate, examples are provided of authors and literary works which might promote environmental sensitivity and issue awareness.]

Recommended Course Content for Children's Literature: Introduction: definition, understanding children, standards for evaluating books, history of children's books, books for the very young. **Folk Tales**: theories, kinds of folk tales, elements of folk tales. **Fables, Myths, and Epics**: parables, proverbs, epic and hero tales, types and sources of myths. **Modern Fantasy**: fantasy with folk tale elements, tales of pure imagination, modern stories of talking beasts, humorous fantasy, science fiction. Examples: Bradbury's The Sound of Thunder, Geisel's The Lorax, Lawson's Rabbit Hill and The Tough Winter. **Poetry**: elements of good poetry, selecting poetry for children, enjoying poetry. Examples: Bierhorst's In the Trail of the Wind: American Indian Poems and Ritual Orations, Fisher's "Sun Prints", Jones' The Trees Stand Shining, Larrick's Green is Like a Meadow of Grass, Lewis' Of This World and The Wind and the Rain, Rosetti's "The Caterpillar". **Modern Fiction**: criteria for realistic stories, stories about minority groups, stories about children in other countries. Examples: Burnford's The Incredible Journey, Byar's The Midnight Fox, George's Julie of the Wolves and My Side of the Mountain, Rawlings' The Yearling, Yashima's Crow Boy. **Historical Fiction**: early writers, books for children of different ages. **Biography**: biography as history, biography as the individual, biography as literature, biography for children. **Informational Books**: criteria for evaluating informational books, major authors. Examples: Darling's The Gull's Way, Drummond's The Population Puzzle, Hahn's Recycling, Kavaler's Dangerous Air, Navarra's Our Noisy World and The World You Inherit: A Story of Pollution, Pringle's The Economic Growth Debate: Are There Limits to Growth?, Feral: Tame Animals Gone Wild, Follow a Fisher, Lives at Stake: The Science and Politics of Environmental Health, Nuclear Power: From Physics to Politics, and What Shall We Do With the Land? **Bringing Children and Books Together**: patterns of response to literature, introducing literature to children. **Issues**: censorship, research, computers, mainstreaming, internationalism in children's literature.

[Note: This course does not lend itself easily to the infusion of the EE goals used in this document, therefore no listing of those goals or sample learner objectives appears here. This course might prove influential, however, in familiarizing the preservice teacher with children's literature appropriate for developing environmental sensitivity and issue awareness.]

HUMAN GROWTH AND DEVELOPMENT

This course provides an introduction to educational psychology for the prospective teacher. Educational psychology is approached as an applied discipline dealing with the nature, outcomes, and evaluation of classroom learning and instruction. Thus, the course focuses on those findings, concepts, and principles from psychology which are helpful in understanding and facilitating classroom learning. Major theories in human development and learning are reviewed and their application to the elementary school classroom are discussed and modelled.

Recommended Course Content: Development and Learning: principles of human development, major learning theories: (1) cognitive development, (2) conditioning approaches to learning, and (3) skill building in the classroom. **Personal and Social Development**: humanistic psychology and the affective domain, motivation and classroom instruction. **Student Variables**: intelligence and creativity social class, race and the disadvantaged, sex differences

and gender-role development, special education and exceptional children. **Classroom Instruction:** teacher characteristics and classroom climate, objectives, planning and evaluation, testing and grading in the classroom, discipline - psychological approaches.

[Note: Because the content of this course denotes no direct linkage with the EE goals used in this document, no listing of EE goals appears here. Similarly, no learning objectives are included.]

CHILD PSYCHOLOGY

A good background in child psychology is critical to the preparation of preservice elementary teachers. Acquiring a genuine understanding of how a person develops into a unique human being is certainly prerequisite to the successful implementation of the educational process. Hopefully, the students will clearly understand the complex and dynamic process of development in children and adolescents, and will come to a realization that development, like education is a human process.

This course provides broad and salient coverage of human development from birth to adolescence. The structure of the course offers topical organization within a generally chronological framework. This organization reflects the interrelationship of all aspects of development.

Recommended Course Content: Introduction: studying human development, methods of research, theories of development. **Beginnings**: genetics, prenatal development and birth. **The First Two Years**: physical development (development of the nervous system, sensory and motor development, nutrition and weaning), cognitive development (perception, cognition, behavioral learning, language acquisition), psychosocial development (emotions, temperament, personality, attachment formation, the emergence of autonomy). **The Preschool Years**: physical development (brain and body, motor skills, gender differences), cognitive development (thinking, language, relationship between language and thought, perception), psychosocial development (theories, relationships with others, gender development). **The Middle Years**: physical development (height and weight, motor development, health and illness, effects of physical growth on thinking and feeling), cognitive development (concrete operational skills, styles of thinking, language, intelligence, moral development, cognitive and social development), psychosocial development (age of industry and achievement, peer relationships, family, sense of self). **Adolescence**: physical development (height and weight, puberty, psychological effects of physical growth, health), cognitive development (cognitive viewpoint, information-processing viewpoint, psychometric viewpoint, social cognition viewpoint), psychosocial development (individuation and identity, social relationships, sexuality, special problems, the emerging adult).

[Note: Because the content of child psychology denotes no direct linkage with the goals being used in this document, no listing of EE goals appears here. Similarly, no learner objectives are included. However, it is possible for instructors to produce learner objectives which are related to EE for specific instructional circumstances. For example, environmental ideas could be incorporated in a discussion of social cognition in children and adolescents. Similarly, case studies and other examples which focus on environmental concerns could be utilized in discussions on the development of moral judgment, political ideas, and religious beliefs.]

LANGUAGE ARTS METHODS

Language learning is critical as a tool for all learning and teaching. This course is designed to help preservice elementary teachers conceptualize the importance of language learning and to develop an appreciation for varied forms of expressive and receptive language in a multicultural and/or global society. Students are exposed to major theories of language learning and the curriculum approaches which grow out of them, and are given opportunities to develop skills in planning language arts instructional units. This course will emphasize written and oral language, and seeks to help students improve their own skills as they develop proficiencies as language arts instructors.

As a component of an environmentalized teacher education programme, this course will provide students with opportunities to research, critically analyze, and synthesize written and visual information on environmental issues. Additionally, preservice elementary teachers will analyze, develop, and implement language arts instructional units.

Recommended Course Content: Goals of Language Arts Education: Theories of Language Learning, i.e., cognitive, social/cultural, whole language. **The Mechanics of Language. The Process of Writing. Speech and Debate. Literature as Discourse. Poetry and Symbolism. Teaching Language Arts**: teaching the mechanics of language, research skills in the language arts curriculum, developing listening skills, planning/implementing/evaluating instruction, setting up the language arts classroom. **Selecting and Using Teaching Methods**: textbooks, non-text material

Environmental Goals to be Facilitated: Upon completion of the teacher education programme, the teacher is expected to be able to . . .

12. . . . apply the knowledge and skills needed to identify and investigate issues (using both primary and secondary sources of information) and synthesize the data gathered.

21. . . . demonstrate the ability to effectively implement instructional materials designed to assist the development of environmentally literate students, i.e., students who are both competent with and willing to apply critical environmental knowledge and skills.

Sample Learner Objectives: Subsequent to the completion of this course, the preservice teacher should be able to . . .

1. . . . utilize library reference skills in the investigation of an environmental issue, produce a written report of the investigation and orally present its results to class members.

2. . . . given a proposed solution to an environmental issue, thoroughly investigate the ecological and socio-cultural implications of the solution and participate in a public debate over the issue and proposed solution.

3. . . . design an instructional unit which incorporates literary works (short stories, poems, speeches, etc.) and which can be used to build an empathy and sensitivity toward the environment and its related problems/issues.

CLASSROOM MANAGEMENT AND MOTIVATION

This course focuses on classroom management skills - that complex set of behaviors which the teacher uses to establish and maintain classroom conditions that will enable students to achieve their instructional objectives efficiently. In this sense, classroom management is a major prerequisite to effective instruction. The purpose of the course is to enable the preservice teacher to cope more effectively with classroom management problems by helping him/her to more fully understand the management dimensions of teaching. A number of models are examined and opportunity is provided to apply these models to problems which are likely to be encountered by the elementary teacher. Methods of evaluating the success of classroom management strategies are also presented and discussed.

Recommended Course Content: Classroom Management as a Process: definition and purpose, specifying desirable classroom conditions, analyzing existing classroom conditions, selecting and utilizing managerial strategies, assessing managerial effectiveness. **Management Models:** the Kounin model - withitness, alerting, and group management; the Neo-Skinnerian model - shaping desired behaviors; the Ginott model - addressing the situation with sane messages; the Glasser model - good behavior comes from good choices; the Dreikurs model - confronting mistaken goals; the Jones model - body language, incentive systems, and providing efficient help; the Canter model - assertively taking charge. **Evaluating Managerial Effectiveness:** teacher/student behavior as perceived by the teacher, teacher/student behavior as perceived by the student, teacher/student behavior as perceived by an independent observer. **Building Classroom Management:** a personal system, a classroom system, a school wide system. **Parental Involvement:** parental expectations, communicating with parents, enlisting parental support.

[Note: Because the content of this course denotes no direct linkage with the EE goals used in this document, no listing of EE goals appears here. Similarly, no learning objectives are included.]

ORGANIZING AND DIRECTING INSTRUCTION

Many professionals believe that this course (or a similar one) is the heart of the teacher education program (TEP). Well it might be because it serves to focus the preservice teacher on the main task of the teacher - instruction. Given this situation, it is critical to make certain that key elements of the instructional act are introduced and taught effectively. Thus, this course will focus on goals of instruction, models of instruction, instructional (learner) objectives, evaluation of instruction, the major taxonomies, instructional methodologies, inquiry in the classroom, simulations, the use of the microcomputer, etc.

Recommended Course Content: Using Goals to Guide Instructional Decisions: curriculum and its relation to goals, assessing the validity of goals, goals needing emphasis, formative and summative evaluation of goal acquisition, national and local impact on goals. **Planning for Successful Instruction:** teaching models for use in the elementary school, the General Teaching Model (GTM), the transition from goals to objectives, performance objectives (components, problems, examples), the role of preassessment, instruction, evaluation. **Sequencing Instruction; Taxonomies and Their Use:** Bloom's Taxonomy (from knowledge to evaluation), using Bloom's Taxonomy to plan instruction, taxonomies in the affective and psychomotor domains. **Asking Questions; Discussion in the Classroom:** planning for discussion, small group discussion, the classroom environment, selecting the

topics, motivation, evaluation. **Inquiry:** basic processes involved in inquiry, guided inquiry (discovery), models of inquiry, the teacher's role in inquiry, real problem solving, issue investigation and evaluation. **Simulation:** purposes of simulation, types of simulation, designing simulations for local application. **The Microcomputer; Classroom Management; The Role of Discipline in Teaching.**

Environmental Goal to be Facilitated: Upon completion of the teacher education programme, the teacher is expected to be able to . . .

21. . . . demonstrate the ability to effectively implement instructional materials designed to assist the development of environmentally literate students, i.e., students who are both competent and willing to apply critical environmental knowledge and skills.

Sample Learner Objectives: Subsequent to the completion of this course, the preservice teacher should be able to . . .

1. . . . communicate, defend, and apply the first four goal levels associated with environmental education (literacy).

2. . . . plan a unit of instruction in EE using The General Teaching Model.

3. . . . develop, implement, and evaluate an effective environmental simulation.

4. . . . implement environmental issue instruction in the elementary school classroom in a problem solving mode.

5. . . . analyze issue investigation in terms of the levels of Bloom's Taxonomy being utilized by students.

MATHEMATICS METHODS

This methods course focuses on the major mathematical concepts and skills which are likely to be taught in the elementary school. It is designed to be taken after preservice students have acquired a broad understanding of mathematics concepts and numerary skills through mathematics content courses. The psychological bases of mathematics education are explored as students examine appropriate concepts and practice various approaches to mathematics instruction. Major emphasis is placed on manipulatives and other learning aids.

Critical thinking skills are also stressed as students develop mathematics lessons incorporating problem solving skills. Where feasible, problems are posed in an environmental context.

Recommended Course Content: **Introduction:** the nature of mathematics, the objectives of mathematics education, mathematics in the elementary school. **Psychological bases of Mathematics Education:** Piaget, Bruner, Dienes, Gagne, Skinner. **Mathematics Concepts and Processes:** number theory, basic facts, geometry, measurement, place value, whole number algorithms, number patterns, rational numbers, problem solving, computer use. **Instructional Approaches:** discovery, deductive teaching, diagnosing error patterns, mathematics literature, demonstration. **Planning Instruction:** lessons and units.

COMMUNITY HEALTH CELL
LIBRARY AND DOCUMENTATION UNIT

Implementing and Evaluating Instruction: peer teaching and/or microteaching, evaluating student performance, using standardized tests.

Environmental Goals to be Facilitated: Upon completion of the teacher education programme, the teacher is expected to be able to . . .

12. . . . apply the knowledge and skills needed to identify and investigate issues (using both primary and secondary sources of information) and synthesize the data gathered.

21. . . . demonstrate the ability to effectively implement instructional materials designed to assist the development of environmentally literate students, i.e., students who are both competent with and willing to apply critical environmental knowledge and skills.

Sample Learner Objectives: Subsequent to the completion of this course, the preservice teacher should be able to . . .

1. . . . utilize mathematical problem solving skills to interpret and find solutions to story problems related to environmental content.

2. . . . graphically display and communicate data related to environmental content, e.g., fluctuations in the size of a species population, amount of a particular resource (coal, oil, trees, etc.) consumed on a national level within a specified period, daily measurements of litter generated within the school, etc.

3. . . . identify a specific grade level and generate a set of five (5) word problems which utilize content associated with discrete environmental issues and which are appropriate for use by students at that grade level.

SOCIAL STUDIES METHODS

The area of social studies is a broad and diverse one with many approaches and purposes. Preservice elementary teachers should acquire an understanding of this breadth, as well as a grasp of the issues and concerns facing elementary social studies teachers today.

Since the teacher of social studies must deal with citizenship education, this course is ideal for infusing those skills and attitudes prerequisite to responsible citizenship in the environmental dimension. Thus, this course provides students with opportunities to engage in environmental decision-making and action, and to plan for instruction which will, in turn, develop responsible citizenship within their own students.

[Note: It is obvious that a social studies methods course is a critical component in a curriculum designed to prepare environmentally-competent elementary teachers. This becomes apparent when one reads the list of environmental goals that can be facilitated through a social studies methods course.]

Recommended Course Content: Essentials of Social Studies: definition and goals, essential skills of the social studies, methods of research in the social studies. **The**

Social Science Disciplines: history, geography, political science, economics, psychology, anthropology and sociology. **The Social Studies Skills**: acquiring information, organizing and using information, interpersonal relationships and social participation. **Teaching Social Studies**: developing concepts, using inquiry, planning/implementing/evaluating instruction, setting up the social studies classroom. **Selecting and Using Teaching Materials**: textbooks, non-text materials, computer. **Social Studies and Special Issues**: dealing with controversial issues, analyzing issues in order to identify the people involved, their beliefs, and their values, issues associated with intercultural education, issues facing the global community, science-related social issues, values/moral education. **Social Studies as Citizenship Education**: the characteristics of responsible citizenship, global citizenship, critical thinking, decision-making, responsible citizenship behavior.

Environmental Goals to be Facilitated: Upon completion of the teacher education programme, the teacher is expected to be able to . . .

7. . . . identify a wide variety of local, regional, national, and international environmental issues and the ecological and cultural implications of these issues.

8. . . . identify and communicate the viable alternative solutions available for remediating crucial environmental issues as well as the ecological and cultural implications of these various solutions.

9. . . . understand the need for environmental issue investigation and evaluation as prerequisite to sound decision making.

10. . . . understand the roles played by differing human beliefs and values in environmental issues and the need for personal values clarification as an important part of environmental decision making.

11. . . . understand the need for responsible citizenship action in the solution of environmental issues.

12. . . . apply the knowledge and skills needed to identify and investigate issues (using both primary and secondary sources of information) and synthesize the data gathered.

13. . . . demonstrate the ability to analyze environmental issues and the associated value perspectives with respect to their ecological and cultural implications.

14. . . . demonstrate the ability to identify alternative solutions for important issues and the value perspectives associated with these solutions.

15. . . . demonstrate the ability to evaluate alternative solutions and associated value perspectives for important issues with respect to their ecological and cultural implications.

16. . . . demonstrate the ability to identify and clarify personal value positions related to important environmental issues and their associated solutions.

17. . . . demonstrate the ability to evaluate, clarify, and change value positions in light of new information.

18. . . . demonstrate a competence with a variety of citizenship action skills from the following categories of skills: persuasion, consumerism, political action, legal action, and ecomanagement.

19. . . . evaluate selected actions in light of their ecological and cultural implications.

20. . . . demonstrate the ability to apply one or more citizenship action skills for the purpose of resolving or helping to resolve one or more environmental issues.

21. . . . demonstrate the ability to effectively implement instructional materials designed to assist the development of environmentally literate students, i.e., students who are both competent with and willing to apply critical environmental knowledge and skills.

Sample Learner Objectives: Subsequent to the completion of this course, the preservice teacher should be able to . . .

1. . . . identify a serious environmental issue, use a map, globe or other graphic means to describe its geographic area of impact, and discuss the ecological, economic and political consequences of the issue and its proposed solutions from local, regional, and global perspectives.

2. . . . given an environmental issue, research and represent a particular position related to the issue (said position may be either self-selected or assigned), and participate in persuading, compromising, debating and negotiating in the resolution of the issue.

3. . . . using the human population issue as a focus, identify and discuss specific regional social and religious values which tend to impede attempts to bring human population growth under control.

4. . . . using the human population issue as a focus, identify and discuss the economic and ecological consequences of uncontrolled population growth.

5. . . . identify a textbook for use in a social studies classroom, analyze the textbook as regards to its relevance to the goals of environmental education, and design a case study instructional unit to illustrate how the textbook programme might be supplemented to accomplish goals of environmental literacy.

6. . . . identify an issue of personal concern and apply citizenship action skills and knowledge in developing a plan of action concerning the resolution or remediation of that issue.

SCIENCE METHODS

Prior to this course, the preservice elementary teacher will have completed the biological, physical, and environmental science sequence, as well as the science process course for teachers. In this methods course, the student is given opportunities to utilize foundational knowledge in those science areas in developing their skills to plan, implement, and evaluate science activities for the elementary classroom.

This course, then, provides a general introduction to materials, teaching strategies, and options available to teachers of elementary school science. The theme which pervades the course is scientific literacy as operationalized by current goals for science education. The course is

heavily lab-oriented, with preservice elementary teachers experiencing numerous science activities which also can be used with children. Preservice teachers will also be exposed to the modern activity-oriented science programs, and will be trained to critically analyze elementary science textbooks and other curricular materials with respect to their usefulness in developing scientific and environmental literacy.

Recommended Course Content for the Science Methods Course: Goals of Science Education: science education with a general education perspective, scientific literacy and Project Synthesis, the Science-Technology-Society thrust. **The Nature of Science**: empiricism, scientific attitudes, science and technology. **Science as Product**: facts, laws, theories, concepts. **Science as Process**: basic science processes (observing, measuring, using space-time relationships, communicating, predicting, inferring), integrated science processes (defining operationally, formulating hypotheses, interpreting data, controlling variables, experimenting). **Approaches to Science Instruction**: concept development, inductive and deductive reasoning/teaching, the learning cycle, process development, inquiry/discovery. **Planning, Implementing and Evaluating Science Instruction**: behavioral objectives, lesson/unit plans, peer teaching and/or microteaching, lesson/unit evaluation. **Science Curricular Materials**: modern science programs (e.g., Science: A Process Approach - SAPA; Science Curriculum Improvement Study - SCIS; Elementary Science Study - ESS), analyzing textbooks and other curricular material, adapting and supplementing existing materials to accomplish the goal of scientific literacy. **Environmental Education**: environmental literacy, goals, teaching strategies, educational research, available curricular materials, adapting curricular materials, infusing EE into appropriate content areas, issue analysis and investigation skills.

EE Goals to be Facilitated: Upon completion of the teacher education programme, the teacher is expected to be able to. . .

2. . . . apply a knowledge of ecological concepts to the analysis of environmental issues and identify important ecological principles involved.

3. . . . apply a knowledge of ecological concepts in predicting the ecological consequences of alternative solutions to environmental problems.

4. . . . understand the principles of ecology in order to identify, select and utilize appropriate sources of scientific information in a continuing effort to investigate, evaluate and find solutions for environmental issues.

6. . . .understand and communicate how an individual's behaviors impact on the environment from an ecological perspective.

7. . . . identify a wide variety of local, regional, national and international environmental issues and the ecological and cultural implications of these issues.

8. . . . identify and communicate the viable alternative solutions available for remediating crucial environmental issues as well as the ecological and cultural implications of these various solutions.

9. . . . understand the need for environmental issue investigation and evaluation as prerequisite to sound decision making.

10 . . . understand the roles played by differing human beliefs and values in environmental issues and the need for personal values clarification as an important part of environmental decision making.

12 . . . apply the knowledge and skills needed to identify and investigate issues (using both primary and secondary sources of information) and synthesize the data gathered.

13 . . . demonstrate the ability to analyze environmental issues and the associated value perspectives with respect to their ecological and cultural implications.

15 . . . demonstrate the ability to evaluate alternative solutions and associated value perspectives for important issues with respect to their ecological and cultural implications.

19 . . . evaluate selected actions in light of their ecological and cultural implications.

21 . . . demonstrate the ability to effectively implement instructional materials designed to assist the development of environmentally literate students, i.e., students who are both competent with and willing to apply critical environmental knowledge and skills.

Sample Learner Objectives: Subsequent to the completion of this course, the preservice elementary teacher will be expected to be able to. . .

1. . . . select a science-related social issue which is environmental in nature, identify the players (individuals and/or groups of individuals involved in the issue) and their positions, and describe the beliefs and values reflected in those issue positions. Additionally, describe the ecological implications of each position.

2. . . . select an environmental issue related to earth science (land use management, flood control, mining, deforestation, acid rain, etc.), write a summary which details the scientific factors involved in the issue, and identify the key earth science and/or ecological principles involved in the issue.

3. . . . identify an issue of local or regional concern, describe the alternative solutions proposed for the issue, and communicate the ecological consequences associated with each of the proposed solutions.

4. . . . -subsequent to the thorough investigation of a science-related social issue of local/ regional concern, design an instructional unit for elementary children. The unit should be targeted at a specific grade level and should include activities which focus on: 1) the science foundational concepts necessary to understand the issue; 2) the players, positions, beliefs, and values involved in the issue; 3) a group investigation of some aspect of the issue; and 4) the generation of a plan of action in which school children might participate as they work toward the solution of the problem

5. . . . identify a textbook which might be used in an elementary science classroom, analyze the textbook with respect to its appropriateness for meeting environmental education goals, and suggest additional activities/units which might be used to supplement the textbook and better provide for environmental literacy.

SCHOOL PARTICIPATION (CLINICAL EXPERIENCE)

This course constitutes the second phase in the experiential (field) component of the professional education programme, and is designed to permit the preservice teacher to become more familiar with instructional practice in an applied setting. The first phase of field work was encountered in the introductory professional education course, The Study of Teaching, and involved the preservice teacher in observation of typical classroom activities and in minimal support of the teacher. In that course, the preservice teacher spent one full day each week in a clinical school where he/she worked with a Clinical Coordinator (CC) and a Cooperating Teacher (CT).

This second phase will provide the preservice teacher with more extensive experience in the clinical school and will gradually move the individual into a more active role in planning, implementing, and evaluating instruction. In essence, this course provides an internship dimension in order to better prepare the preservice teacher to assume his/her role as an instructional leader in the third phase of the experiential component, the student teaching semester.

Recommended Course Structure: Each preservice teacher will spend one-half day, five days each week, for one semester, in a clinical school working with a CC and a team of CTs. The preservice teacher will assist the CTs in planning, implementing and evaluating instruction. This assistance will initially involve the preservice teacher as a teacher aide and as a participant in these processes. By the end of the semester, however, the preservice teacher will bear the responsibility of primary planner and evaluator of an instructional unit, and of delivering that instruction to a small group of students.

Recommended Structured Field Activities: **Share in Appropriate Management Practices**: open the school day, collect lunch fees, monitor lunch room, playground activities supervisor, and conduct dismissal activities. **Assist CTs**: assist in planning instruction, work with individuals/small groups, assist CTs in formulating and delivering instruction, work with CTs in evaluating students, serve as a resource for infusing environmental education units into appropriate content areas. **Plan An Instructional Unit**: working with CTs, plan a unit of instruction which includes preassessment, learner objectives, instructional activities, and evaluation. **Deliver Instruction**: implement the prepared instructional unit with a small group of students on a trial basis. **Evaluate Instruction**: utilizing evaluation items included within the unit, assist CTs in evaluating student work and in evaluating the instructional unit itself, revise unit as necessary.

EVALUATION OF LEARNING AND TEACHING

This course, so very necessary for adequate teacher preparation, focuses on both student and instructional evaluation. Although it is imperative to evaluate student progress (i.e., the extent to which students acquire the objectives of instruction and meet the goals established for them), it is also critically important for the teacher to be able to determine his/her own effectiveness as an instructional leader.

Recommended Course Content: **Course Objectives. Evaluating Student Progress and Teacher Effectiveness. The General Teaching Model (GTM) Reviewed**: the relationship between curriculum, instruction, and evaluation, focusing objectives on both learning and evaluation, preassessment as an evaluation tool, formative evaluation, summative evaluation. **Evaluation to Measure Goal Acquisition. The Role of Student Self-**

Evaluation in the Overall Evaluation Process: techniques for student self-evaluation, when to implement student self-evaluation. **Preparing Evaluation Instruments Which Are Consistent With Objectives. Writing Effective/Valid Test Items**: the place of essay test items, when to use true/false, matching, and multiple choice items, how to write these items correctly, preparing short answer test items. **Developing Checklists and Rating Scales for Evaluating Student Products and Performance. The Use of the Contract and Its Role in Evaluation**: a contract defined, choosing contract components to communicate to students, checking the contract against stated goals and objectives, using the contract as an evaluation tool. **Evaluating Teacher Effectiveness**: teacher self-evaluation, evaluation by supervisors/experts, peer evaluation, evaluation by student performance, students as raters of instructional effectiveness, pros and cons of strategies for teacher evaluation.

[Note: The content of a course dealing with the evaluation of learning and teaching has no direct relationship with the EE goals utilized in this document. Therefore, no listing of EE goals or learning objectives is provided for this course. The instructor is encouraged to infuse environmental content wherever it may be appropriate to accomplishing the goals of this course.]

PROFESSIONAL SEMESTER
(STUDENT TEACHING and PROFESSIONAL SEMINAR)

This semester constitutes phase three of the experiential component of this programme, and moves the preservice teacher into the role of instructional leader. Like the initial course, The Study of Teaching, this semester includes an activity portion (student teaching) and a reflective portion (the professional seminar). The professional seminar is considered a critical element to this semester as it provides the student teacher and the Cooperating Teacher (CT) with opportunities to examine and discuss instructional and management processes and practices.

Recommended Course Structure: The student teacher will work with a CT in a clinical school on a daily, semester-long basis. Each week during the term, additional instructional responsibilities will be assumed by the student student teacher. By the end of the semester, the majority of the instructional planning, implementation, and evaluation will be accomplished by the student teacher, with the assistance of the CT and of preservice teachers assigned to that clinical school (i.e., preservice teachers enrolled in The Study of Teaching and School Participation courses). Throughout the semester, the student teacher and the CT will meet weekly with the Clinical Coordinator (CC) and with other student teachers and their CTs. These meetings will provide opportunities for student teachers, CTs, and the CC to focus on events which have occurred during the previous week. The collective gathering will allow the participants to identify problems in particular classrooms, and to enter into group problem-solving processes to assist individuals in remediating those problems. Thus, the seminar has no pre-focused agenda, but rather, allows the student teachers and CTs to consider management and instruction within the broad milieu of the classroom/school setting.

DIAGNOSIS OF COMMUNICATION SKILLS

This course focuses on the communication processes as critical components in learning, and prepares the preservice teacher to utilize a diagnostic approach to instruction. The basic language arts programs and procedures are reviewed, and major attention is given to implementing the diagnostic teaching model. Preservice teachers will become familiar with specific language arts disabilities, their evidences and causes, and related corrective procedures for their alleviation. Additional instruction addresses the necessity of providing for individual differences and explores appropriate strategies to that end.

Recommended Course Content: **Diagnostic Teaching in the Language Arts**: basic principles of language arts instruction, the importance of experience, the interrelatedness of the language arts, specific language arts skills, diagnostic teaching procedures. **Listening**: listening disabilities, evaluation of listening, creating learning centers for listening. **Oral Communication**: diagnosis of pronunciation and articulation, general oral deficiencies, experiences in oral expression, usage patterns. **Written Communication**: analysis of composing, analysis of pupil work, writing conventions, experiences in written expression, creative writing. **Spelling**: tests, causes of spelling deficiencies and related treatment, teaching strategies, spelling and the affective domain. **Handwriting**: standardized and informal evaluation, diagnostic evaluation, teaching strategies (manuscript and cursive), common errors and difficulties.

[Note: Because the content of the course denotes no direct linkage with EE goals used in this document, no listing of EE goals appears here. Similarly, no learning objectives are included. The instructor is encouraged, however, to utilize environmental content wherever appropriate in addressing the major goals and objectives of this course.]

SCHOOL AND SOCIETY

This segment of the professional component of the teacher education programme focuses on the process of schooling in relation to the value system of the society in which the school functions. The goals and purposes of the educational process, the organizational structure of the school system, and the socio-educational issues which surround the educational process serve as the structure for this course.

Learning experiences should focus on current educational problems and related social issues. As the student attempts to develop an understanding of such problems, investigation will necessarily encompass historical and philosophical perspectives of the educational process. The major goal of this course is to assist the student of teaching and learning (the TEP student) in the clarification of a personal philosophy of teaching and learning.

Recommended Course Content: **Contemporary Practice and Development**: students would investigate current practice and planned development in schools and the Ministry of Education; such investigation should occur within the context of current societal developments. **Historical Perspective**: students would analyze the historical development of educational practice in order to more clearly understand current practice; patterns of school organization, curriculum development, instructional practice, and associated financial support would serve as the focus of such analysis. **Philosophical Foundation**: educational philosophy as the basis of practice would serve as the focus of this study; students would analyze various philosophies of education to determine those elements essential to a sound environmentally oriented philosophy of teaching and learning.

[Note: Although no EE goals or objectives are listed specifically for this course, the course instructor is encouraged to make every effort to analyze and discuss the philosophical underpinnings of environmental education and the environmental movement which typically drives EE. Similarly, if possible, the student could be introduced to the various philosophical perspectives associated with EE itself as well as the instructional practices which are associated with those philosophies.]

"If present trends continue, the world of 2000 will be more crowded, more polluted, less stable ecologically, and more vulnerable to disruption than the world we live in now. Serious stresses involving population, resources, and environment are clearly visible ahead. Despite greater material output, the world's people will be poorer in many ways than they are today."

Global 2000 (Barney, 1982)

PART IV

PLANNING FOR INSTRUCTION IN ENVIRONMENTAL EDUCATION

Part IV of this document deals with instruction specific to environmental education. Specifically, its emphasis lies in the areas of (1) methods associated with the teaching of issues - those methods which are designed to lead to changes in learner behavior and, more importantly, citizenship responsibility, (2) a comprehensive model for designing and delivering instruction in an effective and rational manner, and (3) methodologies appropriate for instruction at each of the goal levels. Selected activities are provided for each of these.

METHODS ASSOCIATED WITH THE TEACHING OF ISSUES

Perhaps the major content area associated with environmental education (EE) and proposed for infusion by this document is the one associated with issues. Therefore, the writers are giving substantial emphasis to issue instruction in Part IV.

What is an environmental issue? Perhaps the simplest definition is as follows: **"An environmental issue is one which has its roots in the environment and involves a problem surrounding which there are differing beliefs and values."** Examples of issues fitting this definition would include (but certainly not be limited to): human population growth, land-use management, nuclear waste disposal, ground water contamination, endangered species, tropical rain forest destruction, clear-cutting in temperate forests, desertification, marine fisheries management, loss of non-renewable energy resources, pesticide use and food production, depletion of fossil water aquifers, wetlands conversion to agriculture and human habitation, recycling, solid waste disposal/management, nonpoint water pollution, air pollution, noise pollution, nuclear power generation, and loss of genetic diversity in food crops.

The writers have established two rules which govern the identification of an environmental issue: (1) it must truly be an issue, i.e., people must, at some point, disagree concerning the status or resolution of the issue [differing beliefs and values are present], and (2) it must have social and/or ecological significance and be related, in some dimension, to the environment. Given that a problem/issue meets these criteria, one can assume that an environmental issue has been identified.

What Should Be the Outcomes of Issue Instruction?

Certainly, a major goal for environmental education is to develop a human being who can become an effective citizen in the world community and be able to contribute to the solution of environmental issues. This goal demands a number of prerequisite skills. These include: (1) the ability to identify environmental issues, (2) the ability to analyze issues and correctly identify the "players" (individuals or groups involved in issues) as well as their beliefs and values, (3) the ability to investigate issues in a manner as to identify the facts surrounding them and their social, economic, political, legal, and ecological ramifications, (4) the ability to evaluate issues and to determine the most effective means of resolving them, (5) the ability to develop an "action plan" which can be implemented in an attempt to resolve or help resolve a particular issue, and (6) the ability to execute an action plan if that plan is consistent with his/her personal values.

These are not instructional objectives familiar to most instructors, are they? Meeting these objectives will necessitate a great commitment on the part of the professional education community and TEP instructors specifically.

Further, meeting those instructional objectives may not be an easy task. If we look at the body of research concerning issue instruction, some very important findings become apparent. These include:

1. Although textbook coverage of issues is on the increase, there is a lack of issue coverage available for use by the teacher. Where issue coverage is present, it tends to be at an awareness level, without opportunity for indepth student investigation of issues or training for citizenship responsibility.

2. Issue instruction is not a pervasive arena for instruction in today's classrooms. Where it is found, it remains, by and large, an awareness activity. Thus, the really critical outcomes associated with issue instruction are not being realized.

3. If citizenship performance is a desired state for students (either at the college level or at the elementary school level), it will not be attained by teaching issues at an awareness level. If we want future citizens to be responsible citizens we must teach them how to be responsible.

It appears, then, that issue instruction must transcend a simple awareness of issues and incorporate direct training in citizenship skills associated with issue remediation. The writers are also of the opinion that, when indepth investigation skills are taught along with citizenship issues action skills, substantial citizenship behavior will result.

With these thoughts in mind, the writers recommend four "Instructional Levels" to be used in issue instruction. These instructional levels are very consistent with the goals layed out in Part I of this document. However, in this instance, one should look at issue instruction specifically and determine what the elements of instruction should be. Thus, the four "Instructional Levels" specified below:

Instructional Levels for Issue Instruction

Level I: The Foundations Level.

This instructional level provides learners with the prerequisite scientific knowledge (content) needed to understand and investigate the issue(s) in question.

Level II: The Issue Awareness Level.

This level provides learners with the conceptual knowledge associated with discrete issues. It also involves an understanding of the "anatomy of

issues" including what separates problems and issues as well as the varying beliefs and values held by societal members which impinge so heavily on the origin and resolution of issues. This goal also involves students understanding the need for them to become involved in issue investigation, evaluation, and resolution.

Level III: The Investigation and Evaluation Level: Training and Application.

This level provides learners with the knowledge and skills necessary to permit them to investigate/analyze issues and evaluate alternative solutions for resolving these issues. It also involves some form of student involvement in the investigation process, including data collection, interpretation, and communication.

Level IV: The Citizenship Responsibility Level: Training and Application.

This level provides learners with the skills necessary for making responsible decisions concerning the resolution of environmental issues. Likewise, it provides learners with an opportunity to prepare and evaluate "action plans" for issue resolution. It supports the application of citizenship action strategies if and when students are motivated to apply their action plans.

What Are the Options for Dealing with Environmental Issues?

It appears as though there are two promising and educationally viable options for dealing with issues in the teacher training programme (TEP) and, subsequently, in the elementary school. Both of these options are easily infused into a TEP. One of these options rests with the development of case studies for presentation in science and social studies classrooms. The other focuses on training students to actually investigate issues on their own and on providing opportunities for such investigation. Both of these options can allow for indepth issue coverage. The first option is probably most appropriate for teachers in training for the lower grades. The second is certainly appropriate for teachers in training for the higher elementary grades (10 year olds and older).

The Case Study Format of Issue Instruction

The case study is, by and large, a teacher-directed analysis of particular environmental issues. It is an instructional method which utilizes both primary and secondary sources to deliver issue-focused information and skills to students. In other words, these sources are, at least initially, used by the teacher to develop a foundation of knowledge concerning the issue. Once students are oriented to the issue, the teacher provides students with the skills needed to investigate the issue on a class or small-group basis. Such a strategy could involve the students in a search of additional secondary sources of information, searching, perhaps, for new data sources that could be synthesized by the class. Or, it could involve a class decision concerning information needed or questions needing answering at the local/community level.

If the instructor/class decides that primary information is needed, this could lead to the development of survey instruments (questionnaires and/or opinionnaires) and the production of

an instrument that the entire class could administer in the community/area. Of course, this would lead to the collection of primary data which would be recorded and interpreted by the class. Once class decisions are made concerning what should be done with respect to the issue, the time has come for citizenship action training and the eventual development of an action plan which may or may not be implemented (depending on decisions made by the instructor/class). In short, the above paragraphs describe the case study.

The case study provides the teacher with a substantial amount of flexibility and control. The extent to which the issue is dealt with is in the hands of the teacher. The teacher can choose the issue, determine the methods to be used, make decisions concerning the depth to which the issue will be studied/analyzed, select the exact point at which the case study will be infused into the existing curriculum, and determine the length of time to be spent on the case study.

There is, however, a price that must be paid for flexibility and control! The costs involve time, energy, and skill in putting the case study together. Most issue case studies are a "do it yourself" curriculum with the instructor as the curriculum designer. Although students can be involved in the selection of a case study, that responsibility generally rests with the instructor. So, too, does the responsibility for finding and selecting sources such as printed matter, video tapes, guest speakers, panel discussion members, films, field trips, or simulation activities. Handouts must be prepared. Evaluation instruments must be designed. The development of a good case study is certainly not an easy task.

AN EXAMPLE CASE STUDY OUTLINE INVOLVING FOUR INSTRUCTIONAL LEVELS

In order for a teacher-developed case study to be maximally effective, it must incorporate dimensions which will prompt changes in learner behavior. As noted earlier, the writers believe that any issue investigation must incorporate four instructional levels in order to have a chance of changing student behavior. These four levels are, again: (1) Foundations, (2) Issue Awareness, (3) Investigation and Evaluation, and (4) Citizenship Responsibility.

The case study outline which follows is an attempt to demonstrate (to the reader) how these four levels would be incorporated into a specific issue case study. The case study chosen for presentation here is one developed by two of the authors of this document and Dr. John Ramsey of Southern Illinois University - Carbondale (Ramsey, Hungerford, and Volk, 1987). Its focus is acid rain. The reader is urged to note how a presentation of acid rain-related science content can eventually evolve into decision-making with respect to attempting to help resolve an issue. It is also important to observe how the four instructional levels are, in fact, interrelated, making a syntactically sound instructional package for this case study. The case study follows on the next page.

THE ACID RAIN ISSUE: A SAMPLE CASE STUDY OUTLINE

Target Audience: Grades 6-8 (U.S.A.)

Instructional Level I: The Foundations Level:

Outcomes at the Foundations Level: The focus of this instructional level will be directed at teaching the relevant science concepts associated with acid rain. These concepts include energy and its forms, energy conversions, air pollutants associated with acid rain, the geographic sources of pollutants, energy conversions in the generation of electricity, coal as an energy and pollution source, properties of acids, and the effects of acids on ecosystems

Delivery Activities for Instructional Level I (The Acid Rain Case Study):

1. Lecture/demonstration on energy, its forms, and its conversion from one form to another, e.g., the conversion of heat energy to electricity.

2. Lecture/discussion on the forms of pollution associated with acid rain (sulphur dioxide and nitrogen oxide) and their sources (utility plants, smelters, auto and truck exhausts).

3. Lecture/discussion on the geographic sources of pollutants in North America (+/- 30M tons annually from the U.S. and +/- 6M tons from Canada).

4. A media presentation and/or guest speaker dealing with electricity generated in a coal-fired utility plant.

5. Class examination of sulphur in various coal samples, e.g., the presence of iron pyrite in Illinois coal.

6. A field trip to a coal-fired power plant to observe energy conversions present there as well as possible sources of pollution.

7. Small group activity related to the properties of acids, e.g., using limestone and dilute hydrochloric acid.

8. Small group activity focused on the germination of radish (or other) seeds in both acidic and control solutions.

Instructional Level II: The Issue Awareness Level.

Outcomes at the Issue Awareness Level: The focus of this instructional level is simply issue awareness, i.e., the knowledge (concepts) directly associated with the issue itself. It includes knowledge of (1) the problem, (2) the causes of the problem,

(3) the consequences/ effects of the problem, (4) the issues surrounding the problem, (5) the social/moral/ scientific/ political/implications of the issue(s), and (6) the proposed solutions.

Delivery Activities for Instructional Level II (Acid Rain Case Study):

1. Presentation of the video tape entitled, "Acid Rain: New Bad News". This tape provides a synthesis of specific acid rain problems, i.e., the effects of acid rain on plants, animals, and entire ecosystems. Further, this tape presents the two major sources of atmospheric acid, the three main theories about the biotic effects of acid deposition, and some information about solutions. (Readings could be substituted for the video tape.)

2. Assignment of small groups of students to summarize various acid rain problems observed in the video tape or read about in assigned readings. Each summary would include a statement of the problem, its causes, the ecological effects/consequences of the problem, and proposed solutions.

3. Assign students to read and summarize an article such as, "Acid Rain: How Great a Menace?" (National Geographic, Vol. 160, No. 5, November 1981).

4. Students, again in small groups, are asked to analyze the acid rain problem and identify the issues that could be inferred from their summaries. These issues would then be communicated to the entire class and recorded for class display/use. It is suggested that students be given an opportunity, at this point, to prepare and interpret posters which display aspects of the cause-and-effect relationships that surround acid rain phenomena.

5. Insofar as possible, the teacher should provide students with additional print (or other) resources that will communicate the ecological, social, economic, scientific, and political implications of the issue(s). Students, again in small groups, should be asked to respond to particular facets of acid rain issue(s), for example, the effects of acid rain on the maple syrup industry in Canada, and communicate the associated implications of this problem.

Instructional Level III: The Issue Investigation and Evaluation Level.

Outcomes at this Instructional Level: The focus at this instructional level is on investigating issues using both primary and secondary sources of information. Part of this process uses an issue analysis method which contains the following components: (1) statement of the issue, (2) identification of the important "players", (3) the players' positions on the issue, and their beliefs concerning the issue, (4) an identification of the values inherent in the players' beliefs, and (5) the identification of alternative solutions for the issue and the consequences of these solutions. Another critical component at this instructional level is the investigation of issues, i.e., problem identification, the production of research questions, the formulation of a strategy for data collection, data collection, and data interpretation/communication.

Delivery Activities for Instructional Level III (Acid Rain Case Study):

1. Students are asked to read various articles which present a diversity of players and their positions related to acid rain issues. Examples of print materials containing positional points of view include: (1) "The Perspectives of the Environmentalists", (2) The View From Industry", (3) "Opposite Ends of the Smokestack", (4) "Acid Rain: Unproved Threat or Deadly Fact?".

2. Students are assigned to small groups in which they will identify prescribed players, their positions, their beliefs, and allied values. Each group will report to the entire class its findings on the analysis assignment.

3. After inferring a discrete player's solution for a particular issue, small groups will determine and communicate the long and short-range consequences of that solution in terms of its implications, e.g., ecological, social, economic, and political.

4. At this point, the instructor should summarize the acid rain problem/ issue(s) to date and ask the students for suggestions as to additional data that would help them better understand the overall impact of the issue(s) locally, regionally, or nationally. From these suggestions should come a need for an investigation that could be conducted via a survey, questionnaire, or opinionnaire. These suggestions might be generated in a brainstorming session participated in by the entire class.

5. There now exists a need for an instrument that the students can use for data collection. Students would need to be exposed to instruction dealing with the writing of research questions, sampling techniques, instrument development, and data interpretation techniques. One source available for this instruction would be Modules II, III, and IV of Investigating and Evaluating Environmental Issues and Actions: Skill Development Modules, Champaign, Illinois: Stipes Publishing Company, 1985.

6. The instructor must now decide whether the investigation process would involve small groups collecting data, the entire class working together, or possibly dividing the class into work groups, some of which would be researching secondary sources in order to compile a review of the literature, while others obtained primary data via the now developed instrument(s). **(Note: It is here where students are most actively involved in the investigation process. This process will, hopefully, empower them to be able, in the future, to investigate other issues as well.)**

7. Data collection completed, students are now asked to organize their data into appropriate tables, graphs, charts, etc. and to interpret and communicate data which would include pertinent conclusions, inferences, and recommendations. Said communication could involve any one of a number of teacher-selected vehicles including reports on the acid rain data by individuals and/or panels.

Instructional Level IV: The Citizenship Training and Application Level.

Outcomes at this Instructional Level: The focus at this goal level is to guide the development of the knowledge and skills needed to help resolve issues in a context of responsible citizenship behavior as individuals and as group members. This goal level includes a knowledge of available citizenship action strategies as well as skill in selecting, evaluating, and applying those strategies in a responsible manner.

Delivery Activities for the Citizenship Training and Application Level (The Acid Rain Case Study):

1. This is initiated by a teacher-led presentation and discussion of citizenship action strategies, i.e., persuasion, consumerism, legal action, political action, and ecomanagement (or combinations of these). The effectiveness of individual vs group action is also emphasized.

2. Small groups are asked to propose solutions for the acid rain issue(s) under investigation (the issue(s) investigated in Instructional Level III).

3. Each small group will develop an "action plan" which uses one or more of the action strategies noted in No. 1 above. This action plan must focus on the proposed solution and includes components necessary for successfully implementing the plan. These components would include: (1) an evaluation of the issue, (2) the students' posture concerning the issue, (3) alternative actions which might be considered.

4. Students are now asked to evaluate the action plan using "Action Analysis Criteria" which considers the following elements:

A. . . . validity of evidence.
B. . . . effectiveness of selected action.
C. . . . legal consequences.
D. . . . social consequences.
E. . . . economic consequences.
F. . . . ecological consequences.
G. . . . consistency with personal values.
H. . . . understanding of necessary procedures.
I. . . . competence with necessary skills.
J. . . . courage needed to take the action.
K. . . . time needed to complete the action.
L. . . . other resources needed to take the action.

5. Students are provided with opportunities and teacher support for implementing their action plan.

Resources for Acid Rain Case Study

Audio-Visual Materials

Acid From Heaven. 16 mm print. National Film Board of Canada, Suite 313, 111 E.Wacker Drive, Chicago, Il 60601.

Acid Rain - The Choice is Ours. Slide/tape. Media Associates, 5230 W. 73rd St., Minneapolis, MN 55435.

Acid Rain: New Bad News. Videocassette, 60 minutes. NOVA-WGBH, Boston, Dec.11, 1984. Time-Life Video, 100 Eisenhower Dr., Paramus, NJ 07652.

Acid Rain Update - Man and Molecules. Audio-tape #1095, 1982. American Chemical Society News Service, 1155 16th St. NW, Washington, DC 20036.

Scientists Look at Acid Rain. Audio-tape, 29 minutes. NPR Journal, No. 820222, National Public Radio, 2025 M St. NW, Washington, DC 20036.

To Catch a Cloud: A Thoughtful Look at Acid Rain. Videocassette, 27 minutes, Edison Electric Institute, 1111 19th St. NW, Washington, DC 20036.

Information Sources

Acid Rain Foundation, Inc., 1630 Blackhawk Hills, St. Paul, MN 55122.

Canadian Coalition on Acid Rain, 105 Davenport Rd., Suite 201, Toronto, Ontario M5R 1H6, Canada

Conservation Foundation, 1255 23rd St. NW, Washington, DC 20036.

Edison Electric Institute, 1111 19th St. NW, Washington, DC 20036.

Electrical Power Research Institute, Environmental Assessment Department, 3423 Hillview Ave., P.O. Box 10412, Palo Alto, CA 94303.

National Audubon Society, 645 Pennsylvania Ave. NW, Washington, DC 20036

National Coal Association, 1130 17th St. NW, Washington, DC 20036.

National Wildlife Association, 1412 16th St. NW, Washington, DC 20036.

U.S. Environmental Protection Agency, 401 M St. SW, Washington, DC 20460.

References

Acid Rain: Looking Ahead. U.S. Environmental Protection Agency, June/July, 1986.

Acid Rain: Science Projects. The Acid Rain Foundation, Inc., 1987.

Acid Rain Study Guide. Wisconsin Department of Natural Resources, #8630, May, 1986.

"Acid Rain: Unproved Fact or Deadly Fact?", Good Housekeeping, June, 1984, P. 236.

"How Many More Lakes Have to Die?", Canada Today, February, 1981.

"How Menacing is Acid Rain?", National Geographic, November, 1981, pp. 652-681.

End of Acid Rain Case Study

The Investigation Skill Method for Dealing With Issues

The case study approach to issue investigation focuses on only one issue category at a time, e.g., the management of grizzly bear populations in western United States and Canada. The issue itself is the intent of case study instruction. As a result, the instructional activities are issue specific. In contrast, the investigation skill method employs a broader, more generalizeable approach to the process of issue investigation. The intent of the investigation methodology is to develop in students the skills involved in issue investigation and resolution so that they can be applied throughout life. Unlike the case study approach, this method provides for the definition, practice, and application of knowledge and skills needed by learners to independently investigate and resolve issues.

Investigation/evaluation skill development builds on the awareness level and proceeds through to the action level. Students learn to differentiate between environmental problems and issues and, in so doing, gain a very important understanding concerning the nature of environmental (social) issues, i.e., people disagree about their resolution, and those disagreements are based on differing beliefs and values related to issues. That understanding provides the basis for the development of a critical skill, that of issue analysis. This ability to analyze issues involves the identification of the different individuals or groups of individuals (players) involved in a discrete issue, and of the positions taken by those players regarding issue resolution. Also involved in issue analysis are the identification and comparison of the beliefs about the issue held by these players, as well as of the values implied by their belief statements. Issue analysis provides the learner with a mechanism for understanding complex social and environmental issues. As such it is a potent organizational tool for the learner.

As was stated above, a major purpose of this approach is to develop an autonomous (independent) investigator. In order to accomplish that end, important skills which must be developed involve formulating problem questions, identifying sources of information to answer those questions, and designing strategies to attain that information. Simply put, the learner must become skilled in answering questions such as: what do we need to know about the issue; where can we get that information; and how can we get it?

In order to gain those skills, learners are given the experiences of researchers. Subsequent to learning how to generate research questions, they are taught to effectively utilize

both primary and secondary sources of information in the investigation of issues. Locating and accessing information from appropriate agencies, resource people, and library sources are important aspects of information gathering. Additionally, learners become adept at analyzing information (and information sources) for bias. The ability to compare and contrast discrete pieces of information, and to identify the values and beliefs inherent in each are important powerful analytical tools, and learners must be given opportunities to practice those tools on a variety of issue-related information.

Students also learn that primary information might be gathered through the use of interviews, or through instruments such as surveys, questionnaires, and opinionnaires. In training youngsters in the design and administration of survey instruments, an application component is essential. Thus, we cannot simply tell students how to design and administer instruments. . .we must also allow them to become involved in the design and administration of instruments. And, following the collection of data pertinent to the research question(s), the interpretation of those data must be attended to. Therefore, youngsters receive instruction and practice on generating logical conclusions and inferences, and on making appropriate recommendations based on the data collected, rather than on emotion.

Since a major purpose of this approach is to develop autonomous investigators, the writers encourage instructors to permit youngsters at this time to engage in an independent investigation into an issue of their own choosing. Such a thorough investigation is prerequisite to sound decision making in the environmental realm, and to responsible participation in citizenship action related to the remediation of environmental issues. To allow a learner to engage in independent investigation prior to his/her development of investigative abilities is foolhardy on the part of instructors. To refuse to allow an issue investigation at this point will certainly result in a weaker instructional effect. That is, it appears that this component is necessary in order to provide an opportunity for students to apply the varied and sophisticated skills which they have been taught, thereby reinforcing those skills. So too, as the writer have observed on numerous occasions, an autonomous investigation allows a students to make an "investment" of his/her talents, interests and time in a preferred issue. Not only do students become experts regarding that issue, but they also derive a sense of "ownership" toward that issue. This sense of ownership, or feeling of responsibility provides the impetus for action-taking in a positive manner.

Citizen action training, the final component of this skill development approach, seeks to develop individuals who are able to make wise choices regarding appropriate and effective citizen behaviors and who are willing and able to apply those behaviors responsibly to environmental issue remediation. Thus, learners become familiarized with the methods of action at their disposal as citizens, and become skilled in the use those actions. In the United States, those actions include ecomanagement, persuasion, consumerism, political action, and legal action. Moreover, decision making skills are sharpened as learners evaluate proposed actions with respect to their effectiveness and appropriateness, and with respect to the ecological, social, economic, political, and other cultural consequences of the proposed actions. Finally, learners are asked to formulate a plan of action which they might utilize in relation to the environmental issue which they have investigated. The instructor is also urged to provide learners with the encouragement and support to implement their action plans.

Thus, in the skill development model, learners develop the abilities to gather and evaluate information about environmental issues, to make sound decisions regarding appropriate environmental maintenance and remediation, and to take action as responsible citizens in helping to resolve environmental issues. This method, as with most instructional methods, has a variety

of problems and limitations. Because it is a developmental approach, it requires careful sequencing and sufficient time, and may not easily lend itself to infusion into an existing curriculum. Educators have typically found that a complete eighteen week semester is needed to complete the learner objectives. The model is quite appropriate, however, to a team approach, where a science teacher, social studies teacher, and/or language arts teacher join forces, sharing the particular subject matter expertise of each. Interestingly, this team approach can shorten considerably the time needed for this model.

Further, a variety of classroom management techniques are critical in those aspects of instruction where the students are actually investigating a large number of different issues. Here the instructor must act as a facilitator between a variety of resources and the many students in the process of investigating issues. In particular, some instructors have found it difficult to make the transition from direct instruction to a role which demands advising and consulting. Allowing students to independently investigate environmental issues is sometimes viewed by teachers as an unfamiliar and threatening departure from "traditional" classroom management practices.

AN EXAMPLE ISSUE INVESTIGATION/EVALUATION PROGRAMME

At least one investigation skill methodology has been formalized and published, i.e., Investigating and Evaluating Environmental Issues and Actions: Skill Development Modules (Hungerford, et al., 1985). This investigation skill program is organized into a series of six modules. The modules are interdisciplinary in nature and introduce learners to the characteristics of issues, the skills needed for obtaining and processing information, the skills needed for investigating and analyzing issues, and those skills needed by responsible citizens for issue resolution. Thus, this approach offers a powerful vehicle for the investigation of a multitude of different environmental issues by students of many ages (upper elementary and above).

Throughout this issue investigation strategy, students learn particular skills and perform very specific tasks. It appears worthwhile to lay out this proven schema for reference by teacher educators. What follows is a somewhat abbreviated sequence of behaviors expected of the students involved in this programme. All activities have proven themselves important but those which are the most critical are written in bold type.

ISSUE INVESTIGATION/EVALUATION PROGRAMME
FLOW CHART OF EXPECTED BEHAVIORS

In Module I:

1. . . . describe how human activities impact on the environment.

2. . . . explain how a lessening of the quality of the environment eventually lessens the quality of human life.

3. . . . explain how a person's beliefs influence his/her position on an issue.

4. . . . explain why a particular environmental situation fits in the "issue" category.

5. . . . **analyze environmental issues and identify the "players", the beliefs, and the values that are associated with that issue.**

6. . . . explain why it is difficult to resolve an environmental issue when there are strong and differing value positions surrounding it.

In Module II

7. . . . **after reading a description of an environmental issue, identify and write problem questions that apply to that situation.**

8. . . . compare two information sources about an important issue, identify the important data (information, beliefs, value positions) in each and communicate how these data differ.

9. . . . identify private and governmental agencies that can be contacted for specific information about an environmental issue.

10. . . . write an appropriate sample letter to an agency asking for information about a particular issue.

11. . . . read two environmental news articles and state at least two differing value positions expressed in each.

12. . . . choose an environmental issue, locate three good references concerning this issue, and list these in correct form.

13. . . . correctly use both the card catalog and the Readers' Guide to find secondary sources about a variety of issues.

In Module III

14. . . . name issues which lend themselves to gathering information using surveys, questionnaires, and opinionnaires.

15. . . . identify, from a list of research questions, those questions that would have to be answered primarily with either surveys, questionnaires, or opinionnaires.

16. . . . identify an issue of local/regional concern and make a list of the information that would need to be collected during an investigation of that issue.

17. . . . **plan for and conduct a research study which focuses on the use of a survey, questionnaire, or opinionnaire.**

In Module IV

18. . . . define "conclusion", "inference", and "recommendation".

19. . . . distinguish between a conclusion and an inference.

20. . . . **evaluate conclusions based on observations.**

21. . . . write conclusions and inferences for everyday observations.

22. . . . **write conclusions, inferences, and recommendations for environmental data.**

23. . . . revise a recommendation (if necessary) based on new information.

In Module V

24. . . . **conduct an autonomous investigation of an environmental issue of the student's own choosing (and approved by the instructor) and report on that investigation to the peer group.**

In Module VI

25. . . . define the action methods of "persuasion", "consumerism", "political action", "ecomanagement", and "legal action".

26. . . . identify advantages of group action which individual action does not have.

27. . . . referring to a specific environmental action designed to help resolve a particular issue, apply the criteria against which the action should be evaluated.

28. . . . **apply all of the action skills and issue knowledge in developing an "action plan" for helping resolve a specific environmental issue.**

Comparing the Two Approaches

Both the case study and the investigation skill approach provide instructional strategies for teachers to effectively deal with issue investigation. Both strategies share similar instructional goals and activities but differ significantly in scope, teacher and student postures, instructional time demands, and a variety of other curricular and classroom management factors. The chart beginning on the following page compares the issue case study and investigation skill approaches across a number of educational characteristics.

COMPARISON CHART
THE CASE STUDY STRATEGY VS THE ISSUE INVESTIGATION METHOD

CHARACTERISTIC	CASE STUDY	ISSUE INVESTIGATION
Characteristics of Students:		
1. Grade Levels	Recommended Gds. 4-12	Appropriate for Gds. 6-12
2. Student Role	A receiver of information and large group researcher	An autonomous, independent researcher; skilled in citizenship action skills
3. Ability Levels	Wide range of abilities	Average and above
4. Sense of "Issue Ownership"	Not necessarily the case	Typically, students have a strong sense of ownership
Characteristics of Instruction		
1. Issue Focus	Single issue treatment; issues most often chosen by teacher	Multiple issue treatment; issues chosen by students
2. Instructor's Posture	Initially, very traditional, subsequently as a facilitator/ consultant during class investigation	Traditional posture followed by role as a consultant and facilitator as students investigate numerous issues
3. Time Demands	Variable - depends upon the case study and the methods involved (2-6 weeks)	Typically, eighteen weeks with one hour per day of instruction in middle school (less at college level)
4. Risk of Experiencing a Syntax Problem	High risk	Low risk
5. Need for Inservice Training	High need	Very high need
6. Potential for Infusion into Existing Programmes/Courses	Very high potential	Moderate potential - requires separate time block
7. Team Teaching Potential	Moderate potential	Very high potential
Outcomes of Instruction:		
1. Knowledge of a Broad Range of Environmental Issues	Low	High
2. Process (Skill) Acquisition	Low-moderate	Very high

3. Citizenship Action Skill Acquisition	Typically, issue specific	A generic set of skills is acquired - high transfer potential
4. Citizenship Responsibility (Out-of-School Behavior)	Moderate behavior observed if instructor covers the skills	A great deal of behavior observed out-of-school

Materials:

1. Source of Materials	Teacher constructed except for issue literature/films, etc.	Published materials are available
2. Expense	Relatively low, depends largely on the issue	Moderate if published materials are put into the hands of the students

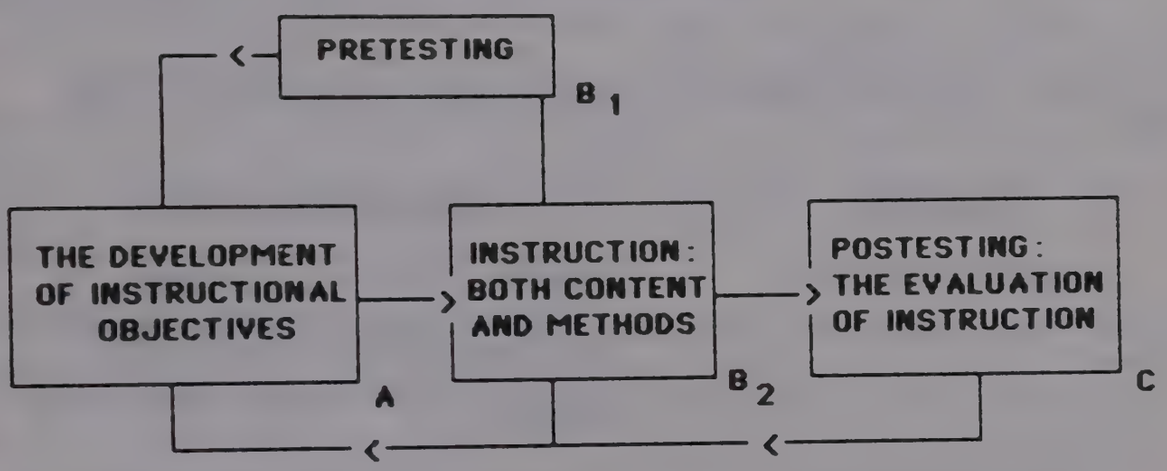
PLANNING FOR INSTRUCTION: THE GENERAL TEACHING MODEL

A set of goals for curriculum development in environmental education was presented in Part I of this document. These goals were divided into four main headings: (1) Ecological Foundations, (2) Conceptual Awareness, (3) Investigation and Evaluation, and (4) Environmental Action. These goals have been validated and used for the development of curricular materials, instructional units, and research instruments. And, they are, again, recommended for use in teacher education.

However, regardless of the set of goals used by instructional planners, a functional instructional model must be applied in order to achieve any semblance of validity in the final product (e.g., the unit, module, activity, curriculum). To produce instructional products without serious consideration being given to the very act of instruction usually results in invalid, inappropriate, and inconsistent materials.

An instructional model which can be used for planning for instruction is diagrammed on the following page and is called "The General Teaching Model". This diagram provides a model for the instructional planner which, if applied rigorously, can result in organized, internally consistent, and valid EE materials for any learner group. Further, it can be applied to any grade level and any content area. Of major significance is the fact that this model can be applied by any team of professional educators attempting to infuse EE content into existing courses in a teacher education programme.

THE GENERAL TEACHING MODEL
(A MODEL FOR ORGANIZING INSTRUCTION)



THIS SCHEMATIC DIAGRAM ILLUSTRATES COMPONENTS OF THE INSTRUCTIONAL PROCESS RECOMMENDED FOR PREPARING FOR INSTRUCTION. PARTS A, B_2, AND C REPRESENT THE CRITICAL COMPONENTS OF INSTRUCTION, I.E., THE INSTRUCTIONAL (LEARNER) OBJECTIVES, THE CONTENT AND METHODS TO BE USED, AND POST-TESTING. PRETESTING (B_1) MUST ALSO BE CONSIDERED AS A CRITICAL COMPONENT WHEN NEEDED IN THE INSTRUCTIONAL PROCESS. NOTE THE INTERRELATEDNESS OF ALL COMPONENTS.

Parts A, B2, and C of this diagram constitute the heart of instruction. Pretesting (B1) should be incorporated only when needed, i.e., there are times when a particular learner group, receiving a particular instructional package, will not need pretesting based on information already known to the instructor. Each of these major components will be briefly discussed below.

Instructional Objectives: Instructional (learner) objectives are critical to the entire process of instructional planning. This component establishes what the learner is to learn, i.e., what the instructor is to teach.

The selection of instructional objectives should be based on: (1) the goals being used, (2) the scope and sequence of the curricular materials being developed, (3) what behaviors the students are expected to demonstrate subsequent to instruction, (4) what the students' capacities are at the beginning of instruction, and (5) the resources available to the instructor.

Once the instructional objective is selected it should be inspected for consistency with the goal(s) being used. It should also probably be stated in performance terms in order to permit the instructor to measure its acquisition during or subsequent to instruction. Several examples of performance objectives appropriate for the goals referred to in Part I of this document are stated in the following list [and can also be found following course descriptions in Part III of this document]:

The Goal Level	The Instructional Objective
Ecological Foundations	Subsequent to the unit on homeostasis, the students will visit a local, stable ecosystem and cite at least three (3) variables which contribute to the homeostatic nature of that ecosystem.
Conceptual Awareness	Following a unit on man's cultural activities and the environmental implications of these activities, students will be able to state two (2) ways in which regional ecosystems are threatened by man's activities.
Investigation and Evaluation	After completing the module on investigation using secondary sources, the students will draw an issue (from a set of issues prepared by the instructor) from a container and locate at least six (6) published references dealing with that issue.
Environmental Action Skills	Students completing the module on environmental action will be able to write a suitable definition for consumerism and cite at least two current issues that could possibly be influenced by that mode of action.

The benefits of using performance-based instructional objectives are many. A few of these benefits follow: Performance-based instructional objectives ... (1) ... contribute to the logical sequencing of content, (2) ... contribute to effective communication concerning expected outcomes between instructional planners and their students, (3) ... help provide a mechanism whereby both instruction and curriculum can be evaluated, (4) ... promote efficient

learning when students realize what is expected of them, (5) ... facilitate pretesting when this component is being used, and (6) ... help evaluators/researchers measure the acquisition of particular goals.

Pretesting is undoubtedly of great value when an instructor is beginning a new unit or commencing to work with a group of unfamiliar students. When used, pretesting should involve an evaluation of the extent to which students have already mastered the performance objectives reflected in the instructional package to be implemented. Pretesting must be consistent with the objectives and anticipated instruction if it is to be of value. In situations where the instructor is thoroughly familiar with the learners - or where courses are very sequential in nature - pretesting for every unit/module may not be necessary.

Instruction: Content and Methods involves the selection of the content most appropriate for enabling students to master the objectives in question. Also involved are the selection of suitable methods, the selection of instructional materials to be used, and the sequencing of activities used in instruction.

Content used for achieving particular goals will probably differ across teacher education programmes. Certainly, schools surrounded by tropical rain forest should learn the concepts associated with "ecosystem" by interacting with the rain forest. It is foolish to ignore the student's own regional biome and focus on another distant region. Similarly, environmental issues vary from region to region and those of immediate concern to the students should be used, at least initially, when instruction is being planned.

Availability of instructional materials will also differ from school to school and region to region. Some schools will have access to many visual aids while another does not. The same is true for library resources, access to the representative biome, resource people, and laboratory facilities. These considerations must be kept sharply in focus when planning for instruction. This is not to say, however, that an instructional planner should not do everything possible to circumvent what appears to be a lack of available instructional resources.

Modes of instruction are critically important. The best available methods should be employed when designing and implementing instructional materials. A field trip may prove eminently more profitable than a lecture about a resource. Debate may provide considerably more values clarification than simply reading about an issue. A laboratory may well teach far more about an ecological principle than a discussion about that principle. Methods can make the difference between a powerful learning experience and one that fails to result in the acquisition of desired knowledge, skills, or attitudes.

Posttesting is probably a poor term to describe all of the attributes of this component because it infers that evaluation will take place upon the completion of the unit or module. Certainly, many objectives can and will be evaluated enroute, as students progress through the learning sequence. Many affective objectives, for example, can be evaluated by the instructor's observation of learner behavior during a variety of activities, e.g., the student's involvement in the values clarification process during a debate, an issue analysis activity, or a simulation.

Still, many objectives will be evaluated subsequent to instruction. Regardless of when evaluation takes place, the critical thing to keep in mind is to guarantee that students are evaluated on the objectives as stated, in a manner consistent with instruction. Herein lies a much too common problem in education, that of preparing objectives, providing instruction, and then evaluating learners on some other set of objectives.

If the performance-based objectives have been carefully prepared and clearly stated, evaluation becomes a relatively simple matter. Of course, the evaluation mode or strategy will depend entirely on the way in which the objectives have been stated, i.e., the evaluation instrument will measure what the objectives specify as appropriate learner behavior following instruction. For example, an objective which asks for a description of an object or event should not be evaluated via a multiple choice test instrument. And, conversely, an objective that demands that a student be able to choose the correct response from a number of responses cannot be evaluated via an essay question. Consistency of evaluation is critically important. Further, the instructional planner should consider how evaluation will have to proceed when he/she writes objectives in the first place.

Oftentimes educators infer that the evaluation process is measuring only student success. This is only partly true in that posttesting is a remarkably good indicator of the suitability or success of the instruction itself, particularly if the objectives and instruction are sound. Posttesting is also a powerful mechanism for establishing the need for revision in either the objectives or instruction or both. When revision is called for (and it will often be indicated), it should be undertaken promptly and with careful planning.

An Example Activity Demonstrating the Application of The General Teaching Model

CONSUMER PRODUCT NEED AND ENVIRONMENTAL COST ASSESSMENT

Notes: 1. This activity is one designed for use with Goal Level III, the Investigation and Evaluation Goal Level (see part I of this document).

2. One specific goal is: . . . to identify and clarify personal value positions related to important environmental issues and their associated solutions. [This activity is also appropriate for discrete goals in the Awareness Level and the Action Level.]

3. This activity can be used in teacher education programmes in any course where consumer behavior or resource management is taught.

4. At first glance, this activity may appear to be useful only in developed nations. If used as it appears here, that may be the case. However, this activity can and should be adapted for use in other nations as well. The "need vs cost" concept should be taught throughout the world. It could be adapted for use with consumer practices related to firewood, animal manure, animal skins, song birds, and other things consumed in different parts of the world. Readers should feel free to adapt this activity as needed.

THE ACTIVITY

Instructional Objectives:

Upon or during completion of the product need and environmental costs assessment activity, students will be expected to be able to . . .

1. . . . state six questions (criteria) which must be answered to assess the environmental impact of a product.

2. . . . state three considerations to be made in assessing the need for a product.

3. . . . apply the criteria of product need and environmental cost to a product which he/she consumes, and give reasons for the final assessment decision.

4. . . . explain the roles of information (knowledge) and values (feelings) in determining the product need and environmental cost.

5. . . . identify, locate and utilize reliable sources in making a thorough search for information needed in the application of environmental cost criteria.

6. . . . based on his/her own product assessment, identify at least three alternative actions (for further evaluation) which may impinge upon the product (e.g., boycott, conservative use, substitution).

To the Instructor:

The specific approach to be used with this activity depends upon the context in which it appears. However, several basic guidelines may be described to make the learning experience effective. For purposes of this discussion, assume the activity is to be used in a social studies methods class which has been involved in the study of cultural impact on the environment.

The approach taken here is to present students with an overall concept, then model the criteria to be applied, and finally allow students to apply the criteria to a product of their choosing. The activity might also be used in an inquiry (inductive) mode which would allow large or small groups to generate their own criteria as well as apply them to products. In the approach used here, the following student materials should be prepared and distributed. When students have interacted with the reading and activity, the materials should be discussed to prepare them to achieve Objectives 3, 4, 5, and 6. Finally, students (individually or in small groups) will identify their own product for assessment and apply the criteria.

Student Materials for This Activity

Consumer Product Need and Environmental Cost Assessment

As consumers of services and products, we take consumer actions every day with affect the environment. Consider the list of products on the following page. You will use some or all of these at least occasionally.

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1. This activity adapted from Hungerford, et al. Investigating and Evaluating Environmental Issues and Actions. Champaign, Illinois: Stipes Publishing Company, 1985.

1. soft drinks (soda or pop) in disposable cans.
2. electric hair dryers.
3. plastic sandwich bags.
4. automobiles.
5. refrigerators.
6. hamburgers in disposable containers.

(Note: In some nations a completely different list of consumed products/ materials would be called for. The list should be adapted as needed.)

Certainly, you could add many other products to this list. Are the effects of these products on the environment negative or positive?

Actually, it is nearly impossible to classify a product as completely good or bad for the environment. Instead, a comparison must be made between the harmful effect the product has on the environment (its ENVIRONMENTAL COST) and your NEED for the product.

Assessing Environmental Costs of Products

Assessing the damage a product may do to the environment is not an easy task. To help in making an assessment of environmental cost, a list of questions is presented below. Consider each of these. As an example of how the questions may be used, they are applied to the disposable beverage (pop) can.

1. Is the product made from natural resources which cannot be renewed?

   FOR POP CANS: Pop cans require a number of metals in their manufacture. Since metals cannot be replaced once they are mined from the earth, the answer is definitely "yes", they do require nonrenewable resources.

2. When the natural resource (or product) is taken from the environment, does it change the environment in any permanent and undesirable way, i.e., does it damage the environment?

   FOR POP CANS: Metal for producing cans must be mined. Mining operations always have a measurable effect on the environment. The wastes produced by the mine may pollute water ways; the earth is often scarred permanently. Of course, there is also the matter of the energy it takes to remove minerals from the earth.

3. If the change (damage) is not permanent and can be repaired, is it being repaired?

   FOR POP CANS: Unfortunately, much of the damage remains because repair (recovering the mined land and cleaning polluted water) is so expensive.

4. Does the manufacture, transport, and/or storage of the product damage the environment?

   FOR POP CANS: The transport of canned pop is no more destructive to the environment than transport of bottles. However, the manufacture of pop cans causes pollution - air as well as water - and uses tremendous amounts of energy. This is especially significant, since the can is intended to be used only once.

5. Does the use of the product damage the environment?

   FOR POP CANS: The actual "use" of the can (while drinking the pop) does not.

6. Does the disposal of the product after use pose a problem for the environment?

   FOR POP CANS: This is one of the biggest problems with pop cans. Although it is becoming economical to recycle the metals in pop cans, most will be thrown away.

   Americans consume over 380 soft drinks per person per year. About 65% of these come in non-returnable cans and bottles. That means that millions of cans will end up either as litter in the environment or as solid waste in a land-fill or other garbage dumps.

A Summary for the Example Used (Pop Cans):

A summary of the pop can assessment might appear as follows:

The Question	Cost Assessment of Pop Cans
1	High
2	High
3	High
4	Very High
5	None
6	Very High
Total Assessment----------	High

The decision is that the pop can represents a high cost to the environment.

Assessing Product Need:

Even when an environmental cost assessment has been made for a product, a consumer decision cannot be made until the NEED for the product has been determined. Below are three guidelines for assessing product NEED. After you have read and thought about them apply these guidelines to determine your need for the product.

1. Does the product serve a real need? An imagined need?

2. Are there environmentally desirable (or at least less damaging) substitutes available?

3. Do you value the benefits of the product greater than the costs to the environment?

   (Note: Again, depending on circumstances and location, these questions may have to be revised. The reader should feel free to revise as needed.)

Assessing the Need for the Pop Can.

Answer each of the above questions with respect to your personal need for the pop can. Some space has been provided for your reasoning.

Question 1: Does it serve a real need? _____. An imagined need? _____
Your reasoning: _____

Question 2: Is there an environmentally desirable substitute available? _____.
Your reasoning: _____.

Question 3: Do you value the benefits of the product greater than the cost to the environment? _____. Your reasoning: _____
_____.

How do your responses compare to those of other students in the class? Do you responses reflect your values in any way? The values of your classmates? How?

Possible Actions

Identify three (3) actions (behaviors) which you feel you should consider and evaluate as a result of the pop can assessment. Please do this below:

1. _____.

2. _____.

3. _____.

Applying Your Skills: Now that you have completed the product need and environmental cost assessment for pop cans, choose a product which you regularly consume (use) and apply the criteria to that product. (Note: A worksheet is recommended for this stage of the activity.)

End of Student Materials

Evaluation:

Objectives 1, 2 and 4 may be evaluated as part of a written or oral examination. Objectives 3 through 6 however, are higher level objectives and may be more accurately assessed by evaluating students' work on the activity. Criteria for determining level of achievement may include the following:

1. Has the student thoroughly and accurately researched available sources for information?

2. Has the knowledge been objectively applied to the product cost assessment?

3. Has the student made sufficient attempts to understand his/her own feelings with regard to product need?

4. Are the identified actions consistent with the student's reported assessment findings?

End of Example

RESOURCES FOR INSTRUCTION

Regardless of the teaching model used for instructional purposes in EE, certain resources will prove necessary in order for instruction to be maximally effective. Students cannot be expected to change their behavior and become effective environmental educators when only lecture and discussion are used in the teaching-learning process. For example, teachers must not be expected to learn how to teach children to investigate issues unless they, as well, have the skills needed for, and experience in, issue investigation themselves. How can teachers effectively use field trip strategies successfully unless they have experienced these same strategies themselves? Thus, the preservice teacher education programme (TEP) must be developed and organized in such a manner as to incorporate these same strategies.

What follows, beginning on the next page, is a brief overview of some of the methods (and associated resources) which are recommended for use with the goal levels suggested in Part I of this document ("environmental sensitivity" has also been included due to its critical importance for environmental literacy). Following this methods/resources schematic, a few of the methods are discussed further, hopefully helping the reader to successfully engage these strategies in the TEP. (Note: Part V of this document also presents activities for infusion in specific general education and professional education courses. These activities incorporate and model EE methodologies other than those described on the following pages.)

****

"We can no longer take for granted the renewability of our renewable resources. We must realize that the natural systems - the air and water, the forests, the land - that yield food, shelter, and other necessities of life are susceptible to disruption, contamination, and destruction."

Gus Speth

****

USING A GOAL-ORIENTED FRAMEWORK AS A BASIS FOR ORGANIZING INSTRUCTIONAL METHODS AND RESOURCES

GOAL LEVEL	AVAILABLE METHODS	AVAILABLE RESOURCES
Environmental Sensitivity	Outdoor Education/Recreation	Natural Environments; Outdoor Education Centers, Recreational Areas, Etc.
	School Camping Programmes	School Camps, National Parks, Youth Programmes, Environmental Centers, Etc.
	Field Trips	Nature Centers, Environmental Centers, Wildlife Refuges, Sites of Issue Foci, Natural Areas, Etc.
	Historical/Current Readings (Can be With Followup Discussion)	Books and Other Suitable Reading Materials.
	Presentations/Demonstrations	Adult and Peer Role Models.
	Film Viewing/Discussions	Video Tapes, Movie Films, Filmstrips.
Ecological Foundations	Field Studies	Natural Areas, Refuges, Environmental Centers, Nature Centers, Etc.
	Simulations and Models	Computer Programmes, Diagrams, Printed Simulations.
	Viewing and Discussion	Video Tapes, Movies, Filmstrips.
	Reading and Discussion	Texts and Other Print Materials.
	Lecture and Discussion	Overheads, Worksheets, Lecture Notes, Followup Panel Discus'ns.
Conceptual Awareness	Field Observations	Local, Environmentally Impacted Sites, Sites of Issue Foci.
	Simulations and Models	Computer Programmes, Diagrams, Printed Simulations.
	Case Studies	Teacher Developed Case Studies, Print Materials, Local Issues, Community Resource People.

GOAL LEVEL	AVAILABLE METHODS	AVAILABLE RESOURCES
	Brainstorming (Problems, Issues, & Solutions)	Teacher Organized Brain-storming Sessions.
	Viewing and Discussion	Video Tapes, Movies, Filmstrips.
	Reading and Discussion	Textual and Other Print Matter.
	Lecture and Discussion	Overheads, Worksheets, Lecture Notes, Followup Panel Discus'n.
Investigation and Evaluation of Issues	Secondary Source Investigation	Libraries and Other Collections.
	Primary Data Collection	Data Collection Instruments, Samples as Needed.
	Issue Analysis (Players, Positions, Beliefs, and Values)	Worksheets Involving the Issue Analysis Procedures; Films & Print Materials as Referents.
	Value Clarification/Moral Education	Print Materials, Valuing Exercises.
	Brainstorming of Alternate Solutions	Teacher Organized Brain-storming Sessions, Focus on Student Involvement.
	Action Analysis	Worksheets Using the "Action Analysis Criteria".
Environmental Action Skills	Simulations and Games	Computer and Print Materials.
	Skills Training Sessions	Print Materials and Exercises.
	Action Workshops	Community Resource Persons.
	Action Learning in Community	Community Internship Programmes and Projects, Cooperating Organizations.
	Student(s) Action Projects	Teacher and Resource Persons as Supervisors/Consultants, Required Resources Made Available.

INVENTORYING AND USING COMMUNITY RESOURCES

A few years ago one of the writers of this document had occasion to join a team of professional educators which was assigned the task of evaluating a rural secondary school in southern Illinois. This writer's specific responsibility was to inspect the curricular programme in the science department. One of the first things he noted was the school's setting. The school was out in the country. It was located on perhaps five acres of mowed grass, green from the moderate climate of the region. Just south of the school, no more than 100 yards away, was a large tract of oak-hickory deciduous forest, ungrazed and rich in ecological variables. In front of the school was a wide ditch which was water-soaked. In spots, standing water could be observed complete with plankton and associated water insects and amphibians. Just across the highway lay a railroad track and beyond the railroad was a very large segment of the national forest which was part of the region. Seldom, if ever, had the writer observed a school with equally rich natural resources available within a five minute walk of the classroom. Excited with the prospect of finding an exciting science program for students, the writer observed several classes and spoke with the teachers in the science department. The biology teacher was interviewed last. He was quick to inform the writer that he didn't allow his students out of the classroom and, therefore, didn't use the resources which were so close to the biology room.

Unfortunately, this situation is far more typical than one would like to admit. We often refer to such a situation as a "two by four classroom", i.e., two covers of a book and four walls of a classroom. And, we are almost certain that students coming from such a classroom will not be developing increased environmental sensitivity, will have only limited ecological knowledge, will not be aware of the resources of their region, will not be able to investigate serious issues within the region, and will not know how to help resolve the important issues facing them and their community. This unfortunate state-of-affairs could, at least in part, be remediated by teacher educators who train preservice teachers in the strategies for using community/regional resources in their teaching.

What are some of the strategies associated with the use of community/regional resources? Research is very clear in at least one dimension of this problem. Teachers who are familiar with area resources and have thought through how to use them instructionally are the ones who will use them far more than other teachers.

The writers have been involved in a number of "resource inventories" in the United States over the past twenty years. A "resource inventory" is a printed inventory of both physical and human resources available for instruction within the teacher's own area. This inventory can take a book or manual form, it can be computerized, or it can be developed as a card file to be used by all faculty members in a school.

Researchers have found that those teachers who are trained in the inventorying of community/regional resources and actually get involved in the inventory process are the ones who will use those resources with their students to a far greater extent than other groups. Resources will get even greater use than they will by teachers who are given workshops in a resource inventory and the resources associated with that inventory. Teachers who simply have access to a resource inventory (without special training in its use) use the resources the least. In other words, if professional educators wish to see teachers use community/regional resources, they must train the preservice teacher to inventory resources and help them get involved in the development of a resource manual.

With these thoughts in mind, the writers have incorporated a simple resource inventory form with this section and have also provided a fictional example of what one part of a resource

inventory would look like. The reader should feel free to use and/or modify the inventory form as needed in his/her own particular situation.

What kinds of resources can be inventoried for an environmentally-related resource inventory? A few examples are: resource people such as wildlife biologists, game wardens, botanists, commercial fishermen, trappers, hunters, waste disposal personnel, waterworks personnel, sewage plant operators, insect and rodent control specialists, greenhouse operators, environmental organization activists, and ranchers/farmers. Other examples would include physical resources such as: wildlife refuges and parks, national/state forests, farms, ranches, typical ecosystems (biomes), zoos, fish hatcheries, sewage plants, waterworks, garbage dumps (landfills), electrical utilities, commercial airports, strip mines, fertilizer industries, toxic waste dumps, university facilities such as departments of fisheries and wildlife, local parks having environmental potential, environmental centers, and recycling centers.

What follows are: (1) a sample Resource Inventory Worksheet, and (2) a fictional Sample Resource Inventory. Again, readers are urged to use these documents to help develop training for the use of and the inventorying of local/regional resources.

The Resource Inventory Worksheet

Name of the Resource: _____

Appropriate Content Area Usage: _____

Appropriate for the Following: Field Trip ____; In Class Use ____; Investigation by Students ____; Other ____ (Please Explain) _____

Address/Location: _____

_____

Contact Person and Address: _____

_____ **Telephone:** _____

Suggestions for Use: _____

_____

Use Limitations/Restrictions: _____

_____

End of Worksheet

Sample Resource Inventory
for
File System or Print Document

Kinkaid Wildlife Refuge
(Fictional)

Appropriate Content Areas: *Environmental Science, Introductory Biology, Environmental Methods, Science Methods, Social Studies Methods.*

Appropriate for the Following: *Field Trip, Special Issue Investigations by Students, Specialists Invited to Speak to Students In Class.*

Address/Location: *The Kinkaid Wildlife Refuge is located fifteen kilometers west of Murphystown. Written communications should be sent to:*

The Refuge Manager
Kinkaid Wildlife Refuge
P. O. Box 1600
Murphystown 00459

Contact Person: *Harry Insell, Refuge Manager or Dr. Armond Brewer, Wildlife Biologist*

Telephone: *778-1420; 8AM - 5PM*

Suggestions for Use: *Kinkaid Refuge is an excellent place for students to observe/study the typical flatwoods savanna and pond communities; the refuge is home to ten species of endangered plants and four species of endangered birds and mammals - serious issues surround three of these animal species and refuge personnel are willing for supervised students to observe these animals with certain restrictions; refuge personnel are also willing to speak to appropriate classes on related issues with advance notice or to be interviewed by students conducting serious issue investigations.*

Limitations/Restrictions: *Although the refuge may be visited by any school group making arrangements in advance, supervised college students are the only students who can gain access to certain areas due to the dangers involved. Nor are students allowed in certain areas during the rut.*

EFFECTIVE USE OF FIELD TRIPS

Since many community/regional resources involve the use of field trips, it is extremely important to give the TEP student training in their use. It is also important to incorporate field trips into a TEP programme so as to give TEP students first-hand experiences with resources and issues.

In order to be maximally effective, the field trip should be task oriented. A simple "excursion" outside of the formal classroom is usually a total waste of time. Therefore, it is up to the instructor to provide the parameters needed to insure success. The "task" for the student can be one of several types. It can involve answering one important question in depth. It can involve some sort of inquiry which demands that problem solving skills be applied. It can involve a survey which necessitates the use of a data collection instrument. It can simply involve the description of something (e.g., an ecosystem) which is not available within the confines of the regular classroom. An inquiry-oriented field trip worksheet is included at the end of this section.

Besides providing a definite task for the students on a field trip, several other considerstions are important. Among these are:

1. Making arrangements for transportation, if needed.

2. Planning for student safety.

3. Making a preliminary trip to make sure that the instructor is familiar with the resource.

4. Pretrip discussion with students about the nature of the trip, the resource and the assigned task.

5. Discussion concerning student deportment on the trip, i.e., expectations of student behavior.

6. Posttrip data recording and synthesis. Reports by individual students or small groups may be indicated.

Other parameters may be needed, depending on the nature of the trip. If the instructor is taking the class on a trip to the garbage dump, for example, students may be assigned an additional task of observing litter/illegal dumping along the route to the dump. Or, if the trip is to an excellent example of the dominant ecosystem (biome) the instructor may ask students to take notes on the way home on the ways in which man has modified the biome.

The "Garbage Dump Field Trip Worksheet" included in this section assumes that the instructor is interested in students taking a holistic look at the dump site, its environment, possible issues surrounding the site, alternative disposal methods, land reclamation, and citizen action if needed. Such a worksheet provides students with an opportunity to synthesize a great deal of information back in the classroom and to participate in decision-making about the consequences of one type of human behavior as well as citizen action that might be called for.

THE GARBAGE DUMP FIELD TRIP WORKSHEET

YOUR NAME: _____

DATE: _____

1. Identify, in writing, the location of the dump. What is the extent of the dump site in acres or hectares?

2. How do people living in the surrounding areas use this dumping area as a waste disposal site? (Included should be a list of the major kinds of waste observed here.)

3. Dumps can be classified as sanitary land fills, rubbish burning dumps, or open dumps. Into which category does this dump fit? Why?

4. Is this a legal dumping area, i.e., does it conform to the legal statutes governing waste disposal?

5. Is there any evidence that animals inhabit the dump? If so, what kinds of animals? Do they appear to present health and/or safety problems?

6. Briefly describe the uses of the land areas immediately adjacent to the dump property. Is it residential, farm land, other? What would property values be adjacent to the dump? What kinds of problems does the dump present to area land owners?

7. Are there any water ways within or near the dump site? Do they receive runoff water from the dump? If so, what problems might this cause for surrounding ecosystems?

8. Is there other evidence of pollution in the dump area? (Please consider air, noise, and visual pollution.)

9. How long can the surrounding area rely on the present disposal site? What are the future plans for waste disposal in this area?

10. Are there other alternatives for dumping for the people who are using this dump? If so, what are they?

11. Can this disposal site be reclaimed? If so, how should this be done? Are there legal restrictions/regulations governing reclamation of garbage dumps?

12. What could your class do to attempt to remedy potential/actual problems in this situation? In the case of illegal dumping, should you/your class get involved in this type of controversy? Why?

End of Worksheet

USING DETAILED PROBLEM SOLVING ACTIVITIES TO INSPECT ISSUES/VALUES

Part V of this document displays a number of activities that can be infused into a selected array of TEP courses. These activities are varied and have been proven effective for a number of uses, e.g., planning for citizen action, analyzing issues to identify players, beliefs, and values, teaching issue data collection procedures, analyzing issue-related print materials, conducting an issue-related simulation, and observing (indepth) a regional ecosystem.

Often the course instructor must creatively construct an activity which will help accomplish a particular goal and teach for specific learner objectives. Sometimes, the instructor can adapt (modify) an existing activity for use in a particular course/situation. The activity which follows is one which could be infused into courses ranging from environmental science to math methods. All the instructor needs to do is to write a set of learner objectives appropriate to the course in question. Learner objectives for this problem solving activity could focus on computation, knowledge of water consumption, personal values concerning water use, population pressures on a given resource (water), or the relationship between human behavior and resource consumption. Regardless of the set of objectives used, the student will have to make some decisions about personal/family behaviors which call upon an inspection of values which are probably unconsciously applied each and every day to this resource.

Example Problem Solving Activity

Determining Water Consumption
(An Issue-Related Activity)

How much water do you use? How much water does your family use? How does this compare with other homes in your community? Is this water consumption necessary? How much water could be conserved throughout your community if every home owner/renter chose to use the minimum amount needed for good health and cleanliness? How much could be conserved nationally? These are a few of the questions you can attempt to answer through this activity.

The first task is to determine the weekly consumption of water in your own home. Below you will find a list of uses for water. By carefully observing and measuring water consumption in your own home, complete this computation. Be sure to include other uses you can think of besides those listed here.

Home Water Consumption

Use	Gallons Consumed Per Week
Drinking and food preparation	_____
Dish washing	_____
Clothes washing	_____
Car washing	_____
Bathing, showering, face and hands washing	_____
Toilet flushing	_____
Garbage disposal	_____
Watering grass, flowers, vegetable garden, etc.	_____
Water for pets/livestock (include all uses)	_____
Water lost from leaking faucets	_____
Other _____	_____
Total Gallons Used Per Week	_____

Divide the "Total Gallons Used Per Week" by the total number of persons in your home. This will give you the average number of gallons used per person per week in your home.

Number of gallons per person per week . . . . . _____

The second task is to determine the minimum amount of water needed for all uses in your home. It is sometimes amazing to discover that considerable water can be conserved by changing a few personal habits, repairing leaking faucets, etc. How much water is really needed? Complete the assessment of your minimum needs below:

Minimum Home Water Needs

Use	Gallons Needed Per Week
Drinking and food preparation	_____
Dish washing	_____
Clothes washing	_____
Car washing	_____
Bathing, showering, face and hands washing	_____
Toilet flushing	_____
Garbage disposal	_____
Watering grass, flowers, vegetable garden, etc	_____
Water for pets/livestock (include all uses)	_____
Water lost from leaking faucets	_____
Other _____	_____
Total Minimum Number of Gallons Needed Per Week	_____

Again, divide this sum by the total number of people in your home to get an average.

Minimum number of
gallons per person per week . . . . . _____

At this time, subtract the minimum number of gallons of water NEEDED per week from the original number of gallons of water CONSUMED per week.

How much water could you
conserve per person per week? . . . . . _____ gallons

How does this figure compare with the water savings computed by other students in your class?

What seems to be a reasonable number of gallons that could be conserved by all people you know. This will be determined by discussing average water uses and water savings in your immediate area or community.

How much water could probably
be conserved per person per week
in your community . . . . . _____ gallons

At this point, you are to find out the population of your community. Multiply the average number of gallons of water which could be conserved by the number of people living in your community. This will give you an estimate of the amount of water that could be conserved in your community alone.

Estimate of amount of water that
could be conserved each week in
the community. . . . . _____ gallons

Next compute the number of gallons that could be conserved in the community each year . . . . Simply multiply your last figure by 52 (52 weeks X one week's savings)

Estimate of amount of water that
could be conserved each year in
the community . . . . . _____ gallons

It would be wise to consider whether the estimate of the water that could potentially be saved would have an impact on water resources in your area or community?

Could the estimated water savings help to conserve the underground water supply? (What are the positive or negative ecological effects?)

Could the estimated water savings help to solve a critical water shortage in your region? (What are the positive or negative human health consequences?)

Could the estimated water savings mean less stress being placed on the municipal water works? . . .on the sewage disposal system? It might be a good idea for you to contact the water company and the sewage disposal facility and inquire about these last two variables. (What are the positive or negative economic outcomes?)

Please think about the ecological, human health, and economic effects of water conservation. Do you think it is a good or bad idea to conserve water? Why?

Note: You might also want to determine how your estimate of water conservation in the home would look statewide or nationally. It is a relatively simple matter to compute this. What is the population of your state or nation? _____. You need only multiply this number times your estimate for home water conservation. (Please consider, however, that an error you might have made in your original estimates will be multiplied also by this number when you make your final computation!)

PART V

EXAMPLE INFUSION ACTIVITIES

As noted earlier, this document is directed at demonstrating the viability of developing a professional preservice elementary education teacher training programme which will produce a teacher who is competent to teach for critical goals in environmental education as well as the more traditional goals associated with the elementary school. In PART V, professional educators can review nine select activities which are designed to be used in the infusion process. Regardless of which activity one reviews, it should be remembered that these are only example activities. While an effort has been made to present well developed activities, there is no accompanying mandate to use them as they have been presented. It is understood that segments of various activities may need to be modified to fit the teaching/learning setting in which they are to be used. Further, while an effort has been made to lend some cohesion to these nine activities, they do not constitute a complete activity set. Thus, these activities should in no way be interpreted as a curriculum for infusion. What they do help demonstrate is the ease with which the overall infusion process can be accomplished.

The example activities included in this section serve as an indication of the rich potential for infusing environmental content into the teacher education programme. Two charts have been prepared to provide readers and users of this manual with an overview of important features of these example activities. The first of these, the Outline of Example Activities: The Curricular Framework, provides readers with a general overview of the activities as they relate to select curricular aspects of the teacher education programme. This Outline includes each Activity by title, the title of the Course(s) each activity was designed to be taught in, and an indication as to whether each of these courses is a General or a Professional education course. In addition, the Outline indicates which environmental education Goal Level and Goal(s) toward which each activity is directed.

A review of The Curricular Framework will reveal that six (6) of the nine activities have been designed for use in general education courses, and the remaining three (3) activities have been designed for use in professional education courses. Experienced readers will no doubt notice that many of the designated courses are associated with the natural and social sciences. This should further substantiate the widely held view that courses in these areas are ripe for infusion. However, courses outside of these areas have also been used to demonstrate infusion strategies to help dispel the myth that only science and social studies courses are ripe for infusion. In terms of their goal emphases, the activities cover all five environmental education goal levels, and cover a broad range of goals across those levels (i.e., from Goal 1 to Goal 21). More importantly, five (5) of the nine activities have been designed to emphasize Goal Levels III and IV. The environmental education literature consistently has indicated that these goal levels are most often neglected within programs, even though these goal levels have been deemed as important by professional and practitioners. More recently, the findings of several research studies (e.g., Hines, et al., 1987; Marcinkowski, 1987; Sia, et al., 1986) have found variables associated with these goal levels to serve as significant correlates and predictors of environmentally responsible behavior, further suggesting the importance of educational activities directed at these goal levels.

A second chart has been prepared to provide readers and users with an overview of important features of these example activities and is entitled Outline of Example Activities: The Instructional Framework. This Outline is intended to provide readers with a general overview of select instructional aspects of these activities. In addition to including the Course and Activity titles, this outline provides a general indication of which Instructional Method(s), as well as which of three common Instructional Grouping Patterns are utilized in each activity.

A review of The Instructional Framework will indicate that a variety of instructional methods and grouping patterns have been incorporated into the example activities. The Outline includes only those methods which have been written into the activity, and remains representative to the extent that individuals actually use the intended methods when teaching these activities. While the intended methods have proven to be effective, it is recognized that users of this manual may still choose to modify them. Before doing so, interested readers and users are encouraged to consider the educational consequences/payoff for doing so. For example, an experienced reader will notice that the courses/activities offered early in the programme tend to be listed at the top of the Outline, and that the accompanying methods tend to engage students in lower level cognitive and affective behaviors (e.g., observation and comprehension, receiving and responding). At the same time, those courses/activities listed toward the bottom of the Outline tend to be offered later in the programme. The methods used in these courses are designed to engage students in more complex, higher level cognitive and affective behaviors (e.g., analysis, synthesis, and evaluation; prioritizing and acting on values) (Bloom, et al., 1956; Krathwohl, Bloom, & Masia, 1956). In this context, oversimplification of the methods used in a later course/activity would be likely to seriously compromise the desired cognitive and/or affective learning outcomes of the activity and the course. While it is recognized that any number of factors may influence the use of intended instructional methods (e.g., available resources or trained staff), it is crucial that decisions regarding methods be made on the basis of desired learning outcomes to as great an extent as possible.

In addition, this Outline includes information on the instructional grouping patterns used within each activity. Of the nine example activities, four (4) involve students in individual efforts (i.e., for role playing, training, or assessment), while another four (4) involve students in small group or team efforts. The ninth activity makes use of both individual and small group instruction. Regardless of the whether an activity uses individual and/or small group instruction, all activities provide some opportunity for students to interact on a classwide basis. If the proper classroom climate can be established and these interactions can be easily managed, this kind of interaction will often contribute to desirable cognitive and affective outcomes, such as those noted above.

With this introduction, readers and users should have gained some important insights into these example activities. As a final assist, readers and users may find it useful to know that each activity generally follows the same format. This format includes the following components:

1. Infusion Activity for (The Course Title)
2. The Activity Title
3. Environmental Education Goal Level(s) and Goal(s)
4. Course Prerequisites to the Activity
5. Purposes of the Activity
6. (As Necessary) Background Information
7. The Structure of the Activity
8. Statement To the Student
9. Worksheet(s)
10. (As Appropriate) Synthesis or Addendum

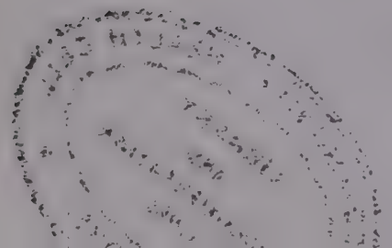
Additional notes of explanation are provided where they seem particularly pertinent or necessary.

OUTLINE OF EXAMPLE ACTIVITIES: THE CURRICULAR FRAMEWORK

GOAL EMPHASIS				COURSE TYPE	
LEVEL	GOALS	ACTIVITY	COURSE	GEN. ED.	PROF. ED.
I	1	Ecosystem Observation	Biological Science I	*	
II	5,7	Population Simulation	Sociology	*	
II	10	The Analysis of Printed Materials	Communications I OR Introduction to Ethics	* *	
III	12	The Collection and Interp. of Primary Data	Science Process for Teachers	*	
III	13	Building an Issue Web	Environmental Health	*	
III	13	The Analysis of Positions on Issues	Science Methods		*
III	14,15	The Identification and Comparative Analysis of Alternative Solutions	Environmental Science	*	
IV	18,19	Planning for Citizen Action	Social Studies Methods		*
V	21	Developing an EE Lesson	Organizing and Directing Instruction		*

OUTLINE OF EXAMPLE ACTIVITIES: THE INSTRUCTIONAL FRAMEWORK

COURSE	ACTIVITY	INSTRUCTIONAL METHODS	GROUPING PATTERN IND.	SMALL	LARGE
Bio. Science I	Ecosystem Observation	Field Observation	*		*
Sociology	Population Simulation	Simulation Game	*		*
Comm. I/ or Intro. Ethics	Analysis - Print Materials	Content/Values Analysis	*	*	*
Science Process for Teachers	Collection/Interpretation of Primary Data	Autonomous Group Investigation		*	*
Env. Health	Building an Issue Web	Brainstorming & Issue Investigation		*	*
Science Methods	Analysis of Positions on Issues	Issue Analysis & Impact Assessment	*		*
Env. Science	Identification/Comparative Analysis - Alt. Solutions	Action Analysis & Force Field Analysis		*	*
Soc. Studies	Planning for Citizen Action	Action Planning		*	*
Org. & Dir. Instruction	Developing an EE Lesson	Lesson Planning	*		*



INFUSION ACTIVITY FOR INTRODUCTORY BIOLOGY

ACTIVITY: The Ecosystem Observation Activity

GOAL: Goal Level I (The Ecological Foundations Level) ... Goal 1: Communicate and apply - in an educational setting - the major ecological concepts including those focusing on individuals, species populations, communities, ecosystems, biogeochemical cycles, energy production and transfer, interdependence, niche, adaptation, succession, homeostasis, and man as an ecological variable.

PREREQUISITES: Prior to the use of this worksheet, students should have completed study in the areas of The Organism, Species Populations and Natural Communities, and The Role of Man in Nature.

The Ecosystem Observation Worksheet

PURPOSE: This activity evaluates, to a considerable extent, the ability of the preservice teacher to apply learned concepts in a natural biological setting. As students, they must respond to a series of questions which demand either direct observation or an interpretation of observations, giving the instructor an excellent perception of whether the students' concepts have been developed accurately and thoroughly. In addition, the activity provides the student with an opportunity to learn more about local ecosystems as well as with an opportunity to synthesize information and interpret a complex biological system.

STRUCTURE OF THE ACTIVITY: In preparation for this activity, the teacher should decide and communicate to students how sites will be selected for analysis (e.g., teacher vs. student selection, one vs. two students per site, etc.). It is suggested that the teacher attempt to insure that the class, as a whole, observes various kinds of ecosystems. The worksheet and any accompanying teacher assignments should be reviewed with students in order to clarify teacher expectations. Upon completion of their observations, students should be provided with the opportunity to present and compare recorded observations as part of a synthesis for the activity.

TO THE STUDENT: This worksheet provides you with an opportunity to apply learned ecological concepts in a natural setting. Whether assigned a specific ecosystem in which to conduct this activity or given the option of choosing your own, you will find it necessary to carefully observe many ecological variables and use these observations in answering the questions (or completing the tasks) asked of you. Be thorough and make your observations carefully.

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WORKSHEET: The Ecosystem Observation Worksheet includes the following questions. Students will need more space to respond than has been provided.

Your Name: _____ Date:_____

1. What kind of living system is this? Would you call this a hardwood forest, a desert, a fresh water pond, a grassland? Just what are you observing?

2. Is this living system a dominant one in the region where you live? That is, is it both extensive and typical in your region? Yes ____ No ____. Why did you answer as you did?

3. Are you able to identify the exact natural boundaries of this system? Yes ____ No ____. What might be some of the difficulties involved in sharply defining this system's boundaries?

4. What are the abiotic (nonliving) factors that seem to be controlling the overall character of this system? You should consider such things as topography, bedrock, humidity, rainfall, temperature, and insolation. How do these things, and others as well, appear to influence the overall character of this system?

5. What species populations of plants and animals can you observe here? What is your evidence?

6. Living organisms may be referred to as "biotic factors". Can you identify any biotic factors that seem to heavily influence the overall character of this system? If so, how do they influence the system?

7. Is there any evidence that layers or zones of life exist in this particular system? If so, how would you describe them? If layers or zones do exist, you may wish to sketch and label them on a separate sheet of paper.

8. Can you observe any evidence of competition between members of a given species population, e.g., between members of a particular species of birds, mammals, tree, etc.?

9. Can you observe any evidence of competition between members of two different species populations, e.g., between members of two species of plants or animals?

10. What other kinds of interactions between members of different populations can you observe here beside competition? For instance, a fungus plant growing on a tree trunk would be an appropriate example. How is each organism affected by the other?

11. What evidence exists to indicate that food energy flows through this system? You may have to make some inferences but the evidence should be available in any dynamic, living system.

12. What evidence exists, if any, to indicate that this environment is more or less stable?

13. Some observers might want to apply the term "static" to this system. The term "static" can be defined as showing little change; lack of animation or progression. Is this a good term to apply to this system? Why or why not?

14. Does man impact on this system in any way? Yes ____ No ____. What is the evidence for this?

INFUSION ACTIVITY FOR SOCIOLOGY

ACTIVITY: A Population Simulation

GOAL: Goal Level II (The Conceptual Awareness Level) ... Goal 5: understand and communicate how man's cultural activities (e.g., religious, economic, political, social and others) influence the environment from an ecological perspective; and Goal 7: identify a wide variety of local, regional, national and international issues, and the ecological and cultural implications of these issues.

PREREQUISITES: Prior to the simulation, students should be familiar with all Basic Concepts; select Science-Related Social Issues (e.g., medical- and health-related, and agriculture-related issues); the Sociology of Movements, particularly of the Environmental Movement; and general familiarity with poverty as one form of Social Pathology.

A Population Simulation

PURPOSE: For pre-service teachers, the desired outcomes of the simulation activity will be a determination of: (a) the nature and extent to population growth in your country (i.e., past, present, projected); (b) the identification of factors which influence both the increase and decrease of this growth; (c) the variety of interests, positions, and issues associated with population growth and with efforts to modify it; and (d) the most acceptable means of influencing the rate of growth, if this is deemed necessary.

SCENARIO: A National Commission on Population and the Future has recently been convened by your government. The charge of this Commission is to develop the guidelines for a governmental policy on population growth for your country. Only three directives were given to this Commission: (a) it must hold a series of regional hearings as a means of soliciting information and expert testimony relevant to this charge; (b) the final hearing must involve one representative from each major interest groups which participates in regional meetings; and (c) following this final hearing, Commission members must hold a working session with these representatives in an effort to arrive at a mutually agreeable set of guidelines to recommend to governmental leaders. This simulation covers the final hearing and the working session.

REPRESENTATIVES: Given the purposes of this simulation, it is recommended that the number of representatives be determined on the basis of the particular population-related conditions extant in each country. However, it is important to recognize that this simulation is best suited for a minimum of six (6) and a maximum of twelve (12) representatives. It is also recommended that the following sectors of a society be adequately represented:

a. Governmental Agencies such as those which oversee immigration and emigration, agriculture, health care, and employment (e.g., in the U.S.: Immigration and Naturalized Services, and the Departments of Agriculture, Health and Human Services, and Labor);

b. Fields of Academic Analysis such as those involving the study of population and demographics, agriculture, health care, and economics;

c. Societal Institutions with an interest in population affairs such as religious and labor organizations (e.g., in the U.S.: Catholic, Protestant, and Jewish Institutions, and Farmworker Labor Unions);

d. Socio-economic Groups such as the middle and lower classes (e.g., a representative for the uneducated, homeless, poor, and/or starving);

e. Advocacy Groups such as the World Population Institute, Zero Population Growth and Planned Parenthood, pro-life and pro-choice groups, and urban-based and environmental groups; and

f. Advocates of Other Recognized Positions such as advocates of technological and economic growth, or of the "Lifeboat" position (e.g., Garret Hardin).

Typical (example) representatives and the positions they might take include (see corresponding categories above):

b. An Agricultural Expert: As an agriculturalist, you are aware of the implications of a growing population, and its demands on food production as first echoed by Thomas Malthus. You have been involved in past efforts to help increase food production (e.g., the Green Revolution), and are carefully monitoring new agricultural advances (e.g., in the area of bio-technology). At the same time you are concerned about the effects of national supply and international demand on both product costs and inflation. Your task is to generate a position statement which develops these considerations into a logical argument for population stabilization.

c. A Representative of the Catholic Hierarchy: You represent the views of the Catholic Church. Although you recognize overpopulation as a serious problem (e.g., in places where many die of starvation and disease), you uphold the teachings of the Church regarding birth control, sterilization, and abortion. You may invoke the papal encyclical "Humanae Vitae" in defense of your position. In developing your statement, it might also be helpful to interview several Church officials.

e. Zero Population Growth: As a representative of ZPG, you advocate world population stabilization. Your concerns cover a wide range of issues, including population growth, family size, immigration, teenage pregnancy, abortion, and national growth policy. Your task is to develop a position which adequately reflects ZPG's policies, with particular attention to each of these sub-issues.

f. Pro-technological/economic development: On the one hand, you are a firm believer in the potential of technology. In your view, population per se is not the problem. Rather, the problem lies in the location of growth centers and the

management of technologies to serve them (e.g., in areas like shelter, transportation, and food production/distribution/energy). On the other, you are keenly aware that when economic growth benefits a majority of the population, it will most probably lead to a reduction in the rate of population growth (e.g., as in Western nations). Your task is to locate noted authorities which support these or similar positions.

STRUCTURE OF THE ACTIVITY: This simulation can be organized as follows:

1. Setting the Stage. The teacher should establish and communicate to students both the format of and time frame for the simulation. This includes:

a. defining the composition (i.e., 4 to 6 adults, including teachers, administrators, parents) and modus operandi of the Commission; and

b. identifying the representatives to be role-played, and describing the general contribution and/or position of each. This may include, but should not be limited to those included under Representatives.

2. Student Preparation. The teacher should establish and communicate to students what will be expected of them prior to the simulation. This includes:

a. having individual students take on the role of an identified representative;

b. indicating that they will be expected to conduct background research on the group they will represent;

c. indicating that they will be expected to develop a position statement based upon their research which reflects accurate, up-to-date information and logical argumentation; and

d. describing that they will be expected to present expert testimony regarding their position to the Commission during the final hearing and during the working session.

3. The Simulation. In order to present testimony and arguments in an equitable fashion, and to maintain an atmosphere of mutual respect and acceptance, certain rules must be strictly adhered to.

For the Final Hearing these include:

a. The Commission Chairperson will determine the order in which the representatives will present their testimony, and will communicate this order to all representatives prior to the hearing; and

b. Each representative will be given 5 minutes in which to present his/her position, along with supporting information, explanations, and/or arguments. Following his testimony, the floor will be opened to members of the Commission and/or other representatives for questions and discussion, and may be curtailed at the discretion of the Commission Chairperson.

For the Working Session these include:

c. During the working session to follow the hearing, representatives and Commission members may enter the discussion only upon recognition by the Commission Chairperson; and

d. During the working session, comments and discussion on any particular topic/issue will be limited to about ten (10) minutes, and may be curtailed at the discretion of the Commission Chairperson.

SYNTHESIS OR SUMMARY: After the simulation participants have been debriefed, the teacher should engage students and other participants in a discussion of the simulation. While allowing for discussion related to the role-playing the teacher should make use of the results of students' background research, and guide discussion toward topics which reflect each of the previously stated Purposes. If possible, it is useful to have students engage in a synthesis-type writing assignment (i.e., focused upon what they learned) prior to and/or following such a discussion.

INFUSION ACTIVITY FOR COMMUNICATIONS I OR INTRODUCTION TO ETHICS

ACTIVITY: The Analysis of Printed Materials

GOAL: Goal Level II (The Conceptual Awareness Level) ... Goal 10: understand the roles played by differing human beliefs and values in environmental issues and the need for personal values clarification as an important part of environmental decision making.

PREREQUISITES: For Communications I: Prior to this activity, students should have covered Paraphrasing and Summarizing, and Analyzing for Validity. They should also have been introduced to Evaluating Information. For Introduction to Ethics: Prior to this activity, students should have covered Theories of Morality, and should have been introduced to the Ethical Dimension of Environmental Problems.

Analyzing Printed Materials for Statements of Belief and Value

PURPOSE: For pre-service teachers, the desired outcomes of this activity include their ability to: (a) identify and restate a proponent's position(s) on an environmentally-related matter presented in print form; (b) identify those passages which reflect that proponent's major rationales or beliefs supporting that position; (c) distinguish between the empirical (i.e., factual) and non-empirical dimensions of those rationales/beliefs; and (d) classify those rationales/beliefs according to the values they appear to reflect.

BELIEF - VALUE FRAMEWORK: For teachers and students to be able to clearly communicate with one another about the methods and outcomes of printed material analysis, they will need to rely upon some common analytic framework. For the purposes of this activity, one of the most important components of an analytic framework is the scheme for classifying statements which characterize proponents' stated positions and rationales/beliefs. From the research literature and from experience in teacher workshops, the types of values which have proven useful in classifying positions and supporting rationales/beliefs include:

> Aesthetic: statements pertaining to the nature and/or value of sensory experience of the environment (e.g., appreciation);
>
> Cultural: statements pertaining to the nature and/or value of the continuation/preservation of the knowledge, beliefs, values, folkways, customs, art, artifacts, etc., of given people;

Ecological: statements pertaining to the nature and/or value of maintaining the diversity/integrity of species populations, habitats, communities, ecosystems, and other natural systems;

Economic: statements pertaining to the monetary nature and/or value of goods and services derived from the environment (e.g., as determined by pricing and production);

Educational: statements pertaining to the nature and/or value of the dissemination, acquisition, or other educational use of environment-related knowledge;

Ethical: statements pertaining to present and future responsibilities - in this case, toward the environment.

Health: statements pertaining to the nature and/or value of human physiological conditions, particularly as they relate to the environment;

Individualistic: statements pertaining to the nature and/or value of individual self-satisfaction and fulfillment, particularly as these relate to the environment;

Moral: statements pertaining to correct ideals or principles of human conduct.

Political: statements pertaining to the nature and/or value of the activities, functions, or policies of governments, their agents, or political parties, particularly as they relate to the environment;

Recreational: statements pertaining to the nature and/or value of the use of the environment for leisure activity;

Religious: statements pertaining to the nature and/or value of the environment based on sacred writings, faith, spiritual or mystical experience, or traditions of religious practice and belief;

Scientific: statements pertaining to the nature and/or value of empirically-derived information, and/or sources of that information.

Social: statements pertaining to the nature and/or value of shared human identity, status, feeling, etc., particularly as they relate to the environment.

STRUCTURE OF THE ACTIVITY: In preparation for this activity, teachers will need to select the print material(s) that students will analyze. For the initial activity, all students should use the same material, and this material should reflect the ideas of only one individual. Once students have been oriented to the activity and its purpose, the teacher should distribute

a copy of that material to each student. As they read the material, students should be encouraged to record notes relevant to Questions 1 and 2 (See Worksheet). Once they have finished reading, students are expected to complete responses to those two questions on their own or in small groups. The teacher should then use these two questions to guide class discussion.

Once it is apparent that the students have adequately identified the main position(s) and supporting rationales/beliefs, students should be asked to respond to Question 3. This may be a difficult question for those students who have not yet been exposed to the term empiricism and ideas associated with it (e.g., verifiable information). Students may also experience some difficulty when attempting to identify the basis used to offer/ defend non empirical rationales/beliefs. It may be useful for the teacher to equate 'basis' with 'traditional and/or personal mode of truth' (e.g., revelation, social consensus, authority, experience, conjecture, intuition, etc.). Finally, if and when students disagree about the basis for a rationale/ belief, they should be encouraged to suspend judgement and investigate it further. Students should be given adequate time to formulate and discuss their responses to this question.

The teacher should break students up into small groups, and ask each group to identify the indicators of prominent values (i.e., statements about the value/worth of entities) which are reflected in the identified position(s) and rationales/beliefs. Before students begin to respond to Question 4, it may be necessary to provide them with examples of value statements. Once the groups have completed their response, they should be provided with a list of types of values presented in the Belief - Value Framework section. Again, it may be useful to review this list with the groups before asking them to respond to Question 5. Once students' questions have been answered and responses to Question 5 have been completed, each group should be given the opportunity to report out their response to Questions 4 and 5. Following the group reports, students should be encouraged to discuss remaining questions and topics. When that discussion has been completed, the teacher should allow, and may even encourage students to discuss/ clarify what they think and how they feel about the position(s) rationales/beliefs, and values expressed in writing by the proponent (See Question 6).

It is likely that the teacher and students will have to work through the analysis of at least one selection of print material together before students will be capable of doing so on their own with a reasonable degree of accuracy. However, once they appear to be capable of doing so, students may be encouraged to select and analyze materials of their own choosing. This may include materials which present two differing views, as this would allow for a comparative analysis.

TO THE STUDENT: During the course of this activity, you will be asked to respond to six questions, five of which pertain to ideas presented in the material you have been given to read. Please read over that material carefully. It would be a good idea to either highlight or take notes on the main ideas presented, as your skill in identifying those ideas will undoubtedly have a bearing on your responses to those five questions. In order to complete responses to those questions you will need to refer back to, and may need to reread sections of the material. This will become more important as you complete and discuss successive questions, as later questions ask for increasingly specific responses. In fact, for questions 3 and 5, you may need to do some additional reading/investigating in order to support your responses. The final question asks you to share your personal thoughts and feelings about the ideas presented in the material. Since this discussion will be saved for the end, you may find it helpful to prepare for it by jotting down personal thoughts and feelings as they occur to you.

WORKSHEET: This activity centers around six questions. Students will need more space to respond than has been provided.

1. What position does the proponent take on the environmental matter presented in the material? If the proponent espouses more than one position, please identify all positions espoused.

2. What are the stated rationales or beliefs (i.e., statements about the nature and/or worth of some entity) used by the proponent to support their position(s)?

3. Of the major rationales and beliefs listed in response to Question 2, which appear to be empirically-based (i.e., based upon verifiable information)? Which do not? Of those that do not, on what other basis, if any, does the proponent offer/ defend them? How can you be sure about your responses?

4. From those passages which present the proponent's position(s) and rationales/beliefs, which appear to convey their prominent values? List, and if appropriate, organize those statements below.

5. From the responses you have generated for Questions 3 and 4, which type(s) of values appear to be reflected in the proponent's stated position(s) and rationales/beliefs?

6. What thought and feelings do you have about the position(s), rationales/beliefs, and values espoused by the proponent? How do they compare to your perspective or stance on this environmental matter ?

INFUSION ACTIVITY FOR SCIENCE PROCESSES

ACTIVITY: The Collection and Interpretation of Primary Data

GOAL: Goal Level III (The Investigation and Evaluation Level) ... Goal 12: apply the knowledge and skills needed to identify and investigate issues (using both primary and secondary sources of information) and synthesize the data gathered.

PREREQUISITES: Prior to the use of this worksheet, students should have been exposed to the Rationale and Goals associated with science skills, and be capable of applying Science Process Skills. Further, the skills associated with issue investigation should also have been defined, modelled, and practiced prior to initiating this activity.

Collecting and Interpreting Primary Data

PURPOSE: For pre-service teachers, the outcomes of this activity should include their ability to: (a) identify and differentiate between survey, questionnaire, and opinionnaire methods for collecting primary data; (b) develop research questions to guide the investigation of particular issue-related topics; (c) design and implement data collection procedures which reflect those methods and those research questions; (d) design and implement procedures for summarizing and interpreting data with respect to that set of research questions; (e) describe how instrumentation and data collection problems can affect the interpretation of data; and (f) based upon available data, pose conclusions, implications, and recommendations regarding the investigation of this issue.

DATA COLLECTION METHODS: Within this activity, students are encouraged to use any of three methods for collecting primary data (i.e., first-hand information): a survey, a questionnaire, and/or an opinionnaire. Teachers should keep in mind that students who decide to use either a questionnaire or opinionnaire may elect to administer their questions in a pencil-and-paper or interview format. Further, students will be asked to collect their data on paper, regardless of the method they use (i.e., they or their subjects will record the data).

For the purposes of this activity, the three methods for collecting primary data may be defined as follows:

> Survey: a direct means of critical inspection used to provide exact information. Often, a survey will involve the study of certain conditions in a specified area. Examples of surveys include:

(a) The number of leaky faucets in a given school building;

(b) The amount and types of litter within a four block radius of a given fast food restaurant;

(c) The number of returnable and non-returnable beverage containers sold in particular grocery stores;

(d) The number and location of abandoned automobiles in a particular neighborhood/community/county.

(e) The number of empty school classrooms in which the lights have been left on for at least a four hour period.

Questionnaire: a carefully written set of questions about a particular topic that is given to a carefully selected sample of human beings. These questions are designed to collect factual information only. Examples of questionnaire subjects and items include:

(a) To heads of households in a given neighborhood: What is the size of your family?;

(b) To heads of households in a given neighborhood: What source of energy do you rely on to heat your home?;

(c) To residents in a given neighborhood: What type of garbage disposal technique(s) do you use?;

(d) To residents in a given neighborhood: Do you currently recycle newspaper? Metal? Glass?; and

(e) To owners of stores which sell beverages in containers: Do you sell any beverages in returnable containers? In recyclable containers?

Opinionnaires: like questionnaires, these consist of a carefully written set of questions about a particular topic, and are given to one or more selected sample of human beings. Unlike questionnaires, they are designed to solicit opinions or beliefs about that topic. Examples of opinionnaire samples and items include:

(a) To automobile owners, car dealers, and car inspectors: Should the local (or state) government require that automobile emissions be tested on a regular basis ?;

(b) To legislators, beverage container manufacturers, and members of recycling centers: Should legislation be passed which requires that a refundable deposit be placed on all metal beverage containers ? On all glass beverage containers ?;

(c) To pet store owners, pet store patrons, and pet owners: Should stricter controls be placed on the import of exotic animals to be sold in pet stores ?;

(d) To state and local officials, and farmers: Are you in favor of instituting economic incentives which would promote farming practices aimed at reducing soil erosion?; and

(e) To local officials, representatives of business/industry, and towns people: Do you believe that locating a chemical manufacturing plant here would be in the best interest of the town ? Of the business community ? Of its residents ?

While each of the three is a somewhat unique method of data collection, it should be apparent from the examples that one can obtain some of the same kinds of information using surveys and questionnaires, and that all three methods may be used to obtain relevant information on the same topic. The examples provided are designed to offer to teachers and students: (a) ideas about the kinds of local issues and issue-related topics they can investigate; (b) ideas about who might be asked to respond to particular questionnaires/opinionnaires; and (c) forms for drafting research questions students use to guide their investigations.

STRUCTURE OF THE ACTIVITY: This activity consists of five parts. During the first part, the teacher should indicate to students that this activity presents them with the opportunity to apply the investigation skills they have been introduced to: they will be given the opportunity to investigate an issue, or issue-related topics of their own choosing. The teacher should identify, define, and provide examples for the three data collection methods emphasized in the activity (i.e., if this has not previously been done) (See Data Collection Methods). Students should then be provided with the opportunity to discuss possible issues they wish to investigate, the available data collection methods, and the investigation skills they will be applying. Teachers may use this discussion to gauge students' readiness for the activity.

To initiate the second part of the activity, students should be provided with Part I of The Collection and Interpretation of Primary Data Worksheet (See Worksheet). The teacher should go over these questions carefully with students. Students should be encouraged to work small groups on their investigation, although capable students may be allowed to work on their own. Teachers and students may find it useful to develop a timetable for completing tasks associated with certain questions, and to review their investigation plan at designated check-points (e.g., review responses to Questions 1 to 3, 4 to 7, 8 to 10, each part of 11, and 12 at separate times). Such structure and feedback is primarily designed to help students successfully complete their investigation. It is important to note that these students will be representing your school and class to community members, hence some teacher oversight or monitoring is appropriate.

Once each group has its investigation plan approved by the teacher, they should begin to implement their data collection plan. Again, it may be necessary or appropriate to have students establish a timetable for data collection. During this phase of the activity, the teacher should be prepared to make time to meet with groups to discuss any difficulties (or successes) they may have encountered. If groups are encountering similar difficulties, it may be appropriate to discuss these as a class.

Once the collection of data has been completed, each group should be provided with Part II of The Collection and Interpretation of Primary Data Worksheet (See Worksheet). Each group should be encouraged to reflect upon their procedures, and attempt to provide complete and

accurate responses to Questions 13 to 17. Then, groups should be asked to respond to the remaining questions (i.e., 18 to 23).

Once groups have adequately completed responses to these questions, each group should be given time to prepare a 10-20 minute presentation of their investigation to the class. This presentation should closely follow the steps in their investigation, and should end with a discussion of conclusions, implications, and recommendations. The latter is particularly important if a group has encountered serious procedural difficulties. After each presentation, members of the class should be allowed to ask questions about and/or discuss important features of that investigation.

TO THE STUDENT: This activity is likely to be both challenging and rewarding to you. You will have the opportunity to collect first-hand data on an environmental issue of your own choosing. Working in small groups and from an outline of questions, you will develop your own research questions and design an instrument to collect data that will permit you to answer those questions. You will actually collect data using your instrument, and thereafter, summarize those data. While this can be a very exciting process, it can be a difficult and exacting one as well. Feel free to discuss any difficulties you may be having with your classmates and teacher, because unresolved difficulties you experience early are likely to become magnified later in your investigation. Once you have completed your investigation, you will be given a set of questions to help you summarize and interpret its outcomes. As the last part of this activity, your group will be asked to report on its investigation to the whole class. Make it worthwhile!

WORKSHEET: The Collection and Interpretation of Primary Data Worksheet includes two sets of questions. Students will need more space to respond than has been provided.

PART I. PLANNING TO COLLECT PRIMARY DATA

Name _____ Date _____

1. Which environmental issues has been chosen for investigation?

2. With respect to this issue, what are the topics that you wish to investigate? Be as specific as you can.

3. With respect to these topics, what are the research questions that you want to be able to answer using the data you collect?

4. Precisely what information do you need to collect to be able to answer your research questions? Identify these variables (i.e., the particular conditions, factual information, demographics, and/or opinions/beliefs) as precisely as you can.

5. Do you plan to use a survey, a questionnaire , or an opinionnaire to collect data on these variables?

6. A. If you plan to use a survey, what defined area(s) will you visit to collect your data?

Area(s):

6. B. If you plan to use a questionnaire/opinionnaire, what population(s) will you approach to collect your data? Further, how will you select and access your sample(s) from each population?

Population(s):

Sampling Method:

7. What are the items and/or questions you plan to use to measure the variables you listed in response to Question 4? As you begin to generate your items/questions, be sure to recognize when you should use more than one item/question to measure a particular variable.

8. How do you plan to organize these items and/or questions (i.e. in the form of one or more instruments)? Are there any logical factors and/or psychological factors (i.e., with respect to your subjects) you should use in organizing/sequencing them?

9. What are the exact data collection procedures you will follow to collect data with this instrument? For example, who will collect the data? When will it be collected? How will the questions be administered? How will the data be recorded? What steps will be taken to insure that all data are collected using the exact same procedures? There are many factors to be considered here.

10. What volume of data will you need to collect to insure that those data are representative of the area(s) (i.e., in surveys) or the population(s) (i.e., in questionnaires or opinionnaires) being investigated? In other words, how much is enough?

11. On the basis of your responses, prepare preliminary drafts of: (a) the instrument(s) you plan to use; (b) a data recording sheet for each instrument; and (c) a data summary sheet for each type of data recording sheet. (Note: If you plan to have individuals respond directly on a paper-and-pencil questionnaire or opinionnaire, you will not need separate data recording sheets.)

12. In addition to asking for feedback on the design of your preliminary drafts, it is recommended that you pilot test your instrument. Your pilot sample need not be large (e.g., 6 to 10

individuals), and, if at all possible, should reflect the population(s) you plan to collect data from.

PART II. INTERPRETING PRIMARY DATA

A. Problems in Data Collection

13. Did the items/questions in your instrument permit you to measure the variables you specified with a reasonable degree of precision? If not, how would explain this?

14. If you used a questionnaire or an opinionnaire, did you find that your instrument was appropriate for the population(s) you drew samples from? If not, how would you explain this?

15. Did your data recording sheets and/or data recording procedures allow the data to be collected with a high degree of consistency? If not, how would you explain this?

16. Did you encounter any other kind of problem in collecting the data you sought (e.g., inability to access areas or samples, incomplete responses by subjects, etc.)? If so, what kind?

17. How do any of these instrumentation/data collection problems affect your data (i.e., your findings)?

B. Summarizing and Interpreting Your Data

18. Before you can respond to the questions below, you will need to: (a) summarize the responses you obtained for each item/question, and record these summaries on your data summary sheets; and (b) identify all instrument items/questions which are associated with each of your research questions. Completion of these two tasks should permit you to more easily review data summaries for all items/questions which pertain to each research question. (e.g., for Research Question 1, you may need to locate and review data summaries for items 2, 7, and 11).

19. Select one of your research questions. Then, on your data summary sheets, locate all item/question data pertaining to that question (i.e., as in the example above). What do these data summaries allow you to say in response to that research question? (Note: This is the procedure you should follow as you develop a response to each of your research questions).

20. What conclusions, if any, can you draw from your data and from your response(s) to each research question?

21. What degree of confidence do you have in those conclusions? Have they, or should they be qualified on the basis of your responses to Questions 13 through 17?

22. What implications, if any, do your conclusions hold for the issue you chose to investigate? For the resolution of that issue?

23. If someone else was to decide to investigate this issue, what recommendations would you make to them based upon your experience ?

****

"The environmental crisis is an outward manifestation of a crisis of mind and spirit. There could be no greater misconception of its meaning than to believe it to be concerned only with endangered wildlife, human-made ugliness, and pollution. These are part of it, but more importantly, the crisis is concerned with the kind of creatures we are and what we must become in order to survive."

Lynton K. Caldwell

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INFUSION ACTIVITY FOR ENVIRONMENTAL HEALTH

ACTIVITY: Building an Issue Web

GOAL: Goal Level III (The Investigation and Evaluation Level) ... Goal 13: demonstrate the ability to analyze environmental issues and the associated value perspectives with respect to their ecological and cultural implications. Note: While this activity is partially a Conceptual Awareness Level activity, the EE Goals to be facilitated by the Environmental Health course include only one Awareness Level Goal (#6), and that Goal does not fit this activity. If you review the Awareness Goals with this activity in mind, it appears to best fit Goal 7: identify a wide variety of local, regional, national and international issues and the ecological and cultural implications of these issues; and to a lesser degree, Goals 8 and 9.

PREREQUISITES: Prior to this activity, students should have covered material up to and including Environmental Health. Within the Environmental Health component of the course, students should have been introduced to pertinent environmental health issues (e.g., solid waste management, sewage disposal and treatment, surface and groundwater pollution, and solution-related issues such as resource recovery).

Building an Issue Web

PURPOSE: For pre-service teachers, the desired outcomes of the issue webbing activity will be: (a) the identification of problem- oriented environmental and health issues associated with the larger solid waste management issue; (b) the identification of solution-oriented environmental and health issues associated with the solid waste management issue; (c) portrayal of those environmental and health issues as the framework of an issue web; and (d) graphic representation of demonstrated and perceived relationships (e.g., causal, interactive) between these issues.

TERMINOLOGY: Several terms are used in this activity which may require definition or clarification by the teacher. For the purposes fo this activity, these terms and their intended meanings include:

Environmental: primarily used in reference to natural/ ecological conditions (e.g., species populations and their habitats, air and water, soil and rock layers, ecosystems);

Health: primarily used in reference to human physical/physiological conditions (e.g., skin, intestinal, respiratory conditions);

Problem: primarily used in reference to perceived adverse impacts of (i.e., causes) or perceived adverse impacts upon (i.e., effects) some bio-physical condition or conditions

(e.g., the ecological and human respiratory effects of exposure to differing types of air pollution);

Solution: primarily used in reference to alternative actions that may be taken in an attempt to curtail such adverse impacts, or to reverse the negative effects of those impacts;

Issues: primarily used in reference to problems and/or solutions on which human beings (i.e., as individuals or as groups) take differing positions, and in reference to positions which they support or defend by using differing rationales.

STRUCTURE OF THE ACTIVITY: There are several productive ways of organizing this activity. Regardless of the sequence used, teachers should engage students in brainstorming, issue investigation (i.e., using secondary sources), and synthesizing results. The following represents one way of introducing students to issue webbing in the context of this course.

This sequence consists of five parts. Prior to beginning the activity, teachers should be prepared to expose students to a partially completed web (e.g., the Issue Webbing example found in this activity, or an example of their own design) on an individual basis (e.g., individual worksheets) and on a collective basis (e.g., blackboard, newsprint, or posterboard). Teachers should begin the activity by illustrating the complexity of many environmental health issues (i.e., large issues which often subsume a number of smaller, interrelated component issues). During this introduction, teachers may need to clarify what an issue is, and to suggest that parties may be at issue over one or more problems, one or more alternative solutions, or as is often the case, some combination of problems and solutions. It may also be useful to help students differentiate between environmental and human health issues which comprise larger, complex environmental health issues.

Once the teacher senses that students comprehend these aspects of environmental health issues, the teacher should introduce students to the issue the plan to use in the remainder of the activity (e.g., the solid waste management issue). The class should be presented with the large, collective representation of the partially completed web for that issue. The webbing format should be briefly described (i.e., including the four quadrants of the web). Then, the teacher should engage in two brainstorming sessions. During the first session, students are asked to suggest adding to, modifying, or deleting from to the partially completed environmental side of the web. In following the rules of brainstorming, students may not modify or delete other student's suggestions (i.e., only parts of the partially completed web provided by the teacher). The teacher, or designee should record students' suggestions in a separate list. When the list is temporarily complete, items on the list are open to discussion, and if agreed upon, to inclusion in the larger, collective web (e.g., on a blackboard). While some attention must be paid to relationships among problem- and solution-oriented issues, the emphasis should be upon developing the basic structure (i.e., component issues) of the web. This will be attended to in greater detail in the last part of the activity. Once students are relatively comfortable with the environmental side of the issue web, the teacher should oversee a second brainstorming session for the human health side of the issue web. The same rules and procedures should be followed as in the previous session.

The third part of the activity focuses upon the improvement and expansion of the issue web the class has created. Students should be organized into small groups, and assigned one quadrant of the web (e.g., solid waste-related environmental problems, solid waste-related human health solutions). It is their task to review secondary source materials which provide information about issues which fall within their quadrant. On the basis of their findings, groups are asked to add to,

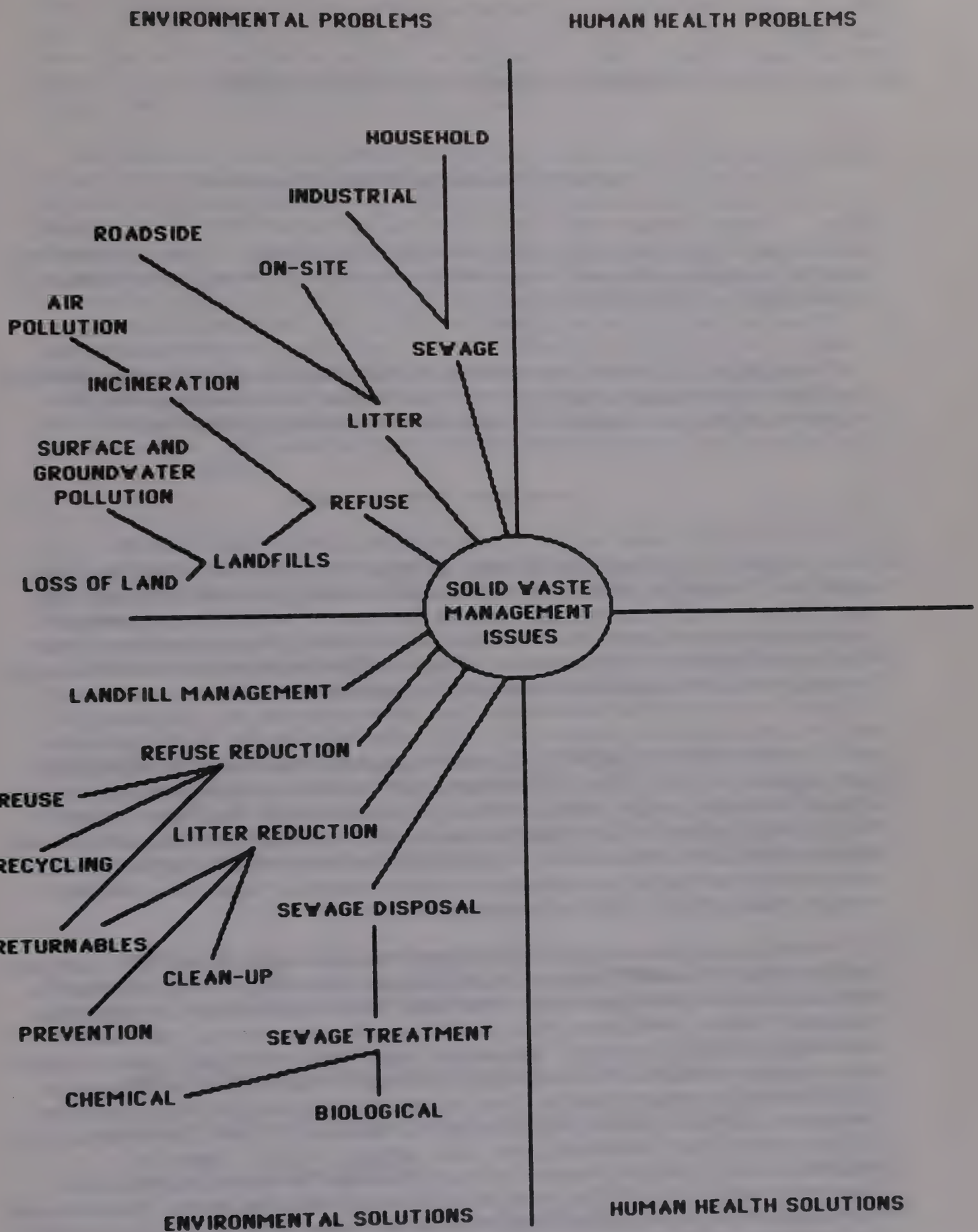
modify, and/ or delete from the web in their quadrant. They may also be encouraged to keep notes about relevant issues which fall in other quadrants, and about relationships between issues in their and in other quadrants.

During the fourth part of the activity, each group will be asked to report back to the whole class the results of their reviews. Each group will have the chance to present and discuss their additions to, modifications of, and deletions from their quadrant of the web. Members of other groups may ask for clarification, or on the basis of their own review, provide additional insight into the proposed changes in the web. Any disagreements about the inclusion/exclusion of any component issue may be resolved in several ways. If the disagreement appears to be information-based, students should be encouraged to provide information to substantiate their view. This may require additional investigation on the part of students and teacher. If the disagreement appears to be based on other beliefs or values, the issue(s) in question should be tentatively incorporated into the web (i.e., to avoid irreconcilable disagreements or rifts in the class).

At this point, the class will have pieced together a detailed graphic representation, or web of the environmental and health issues (i.e., problem- and solution-oriented) which comprise their larger issue. The final part of this activity asks students to discuss relationships among these issues (e.g., contributing causes and effects), and to depict these relationships as part of the web. They may use solid, dotted, or colored lines to depict the various types of relationships they identify. The same rules that applied to inclusion/exclusion disagreements may also be applied here. When the webbing is complete, the teacher should ask students to reflect upon the process and upon the results of their efforts.

NOTE: With minor modifications, this activity can be altered for use in several other courses, notably Environmental Science, Principles of Geography (i.e., as it emphasizes cultural and physical geography), and Physical Science (i.e., in the sections that pertain to nuclear issues or environmental geology issues, as these issues often contain prominent human health/ safety issues). These are all second year courses, and the structure of the activity should reflect this fact.

ISSUE WEBBING



INFUSION ACTIVITY FOR SCIENCE METHODS

ACTIVITY: The Analysis of Positions on Issues

GOAL: Goal Level III (The Investigation and Evaluation Level) ... Goal 13: demonstrate the ability to analyze environmental issues and the associated value perspectives with respect to their ecological and cultural implications.

PREREQUISITES: Prior to this activity, students should have covered course material up to and including Environmental Education. Within the segment on Environmental Education, students should have been exposed to all material up to and including Issue Analysis.

The Analysis of Positions on Issues

PURPOSE: For pre-service teachers, the outcomes of this activity should include their ability to: (a) identify the parties (i.e., individuals and/or groups) involved in an issue; (b) identify the position(s) which each party takes on that issue; (c) identify the rationales and beliefs which each party uses to support its position; (d) identify the prominent type of values which are reflected in, or which appear to underlie the rationales and beliefs of each party; and (e) analyze each party's position for their ecological implications.

STRUCTURE OF THE ACTIVITY: This activity consists of four parts. During the first part, teachers will introduce the topic of issue analysis, as well as introduce and define four basic elements of an issue analysis: parties, positions, rationales/ beliefs, and values. In addition, the teacher will provide and walk through an example of a partially completed analysis which uses these elements (See Worksheet: Part A). Student questions pertaining to the example should be answered before the teacher asks students to add to this example (or to another more relevant example) based upon their own knowledge and experience.

In the second part of the activity, the teacher should have selected a particular issue, and should be prepared to expose students to resource material which contain information about the positions that three or more parties take on that issue. These resource materials may include newspaper clippings, collections of primary and/or secondary documents (e.g., as in some assemblages of case study materials), documentary-type films or video tapes, and recordings of panel discussions or debates. The teacher should ask students to identify the issue following an initial review of the resource material. Once the issue is clearly identified, they should review the resource material in greater detail, using the Issue Analysis Worksheet (See Worksheet: Part B) to record notes about the parties at issue, their positions, and their supporting rationales/beliefs. It may be necessary for students to review the resource material several times before they clearly identify all of the major supporting rationales/beliefs. Students should have the opportunity to discuss the process as well as the results of their review of the materials (See Worksheet: Part C, Question 1).

Once these parts of the Issue Analysis Worksheet have been completed, students should be asked to identify the types of values reflected in each party's stated rationales/beliefs. To assist them in this task, students should be provided with a copy of the Belief - Value Framework used in The Analysis of Printed Materials Activity. As indicated in the Model, students should record the types of values in the appropriate spaces on the Worksheet. Again, students should be encouraged to discuss their results (See Worksheet: Part C, Question 2).

The final part of this activity consists of an analysis of the ecological implications of each of the positions students identified. Here, students should assume that each position will (hypothetically) guide future activity, and should attempt to assess what the major ecological consequences of the resulting activity will be (i.e., both benefits and costs/impacts). In effect, students are asked to conduct a simplified version of the ecological portion of an environmental impact assessment for each position. The level of rigor of these assessments is likely to depend on a variety of factors (e.g., teacher intent, student background/familiarity with the issue, available time and resources). Nonetheless, as students discuss the probable and possible ecological consequences of each position, they should attempt to consider the effects of these consequences over time (i.e., immediate, short-term, and long-term). Finally, once the ecological implications of each position have been adequately discussed, students should be encouraged to compare the various positions on an ecological basis (e.g., rate them from least to most destructive). The teacher may wish to use the Questions provided in the Worksheet: Part D to guide this discussion.

TO THE STUDENT: Environmental issues exist because human beings take differing positions relative to environmental problems and/or their solution. They also exist because these positions reflect differing rationales (i.e., espoused beliefs and/or values). This activity, and the accompanying Worksheet is designed to help you organize relevant information about the parties involved in an issue, the positions they take, the rationales and beliefs they use to support their position, and the values they hold. You should take some time to review the Model Issue Analysis, as this should give you some idea about how to begin your analysis. Once you do begin an analysis, you may need to review your resource materials several times in order to obtain and check all relevant information. And, once completed, you should have a pretty good perspective on the parties involved, the positions they take, and why they take those positions. Certainly, you would have enough information with which to compare the various positions taken. More importantly, the information you would have organized should provide you with a basis for predicting what the ecological consequences of each position are likely to be. These predictions should contribute new and important information to any comparison of positions you may wish to make.

WORKSHEET: This worksheet is composed of four working sections, one for each part of the activity. In reference to Parts A. and B. (below), a partially completed Model Worksheet is presented with this activity. A student worksheet will need to be constructed using this one as a model.

PART A. MODELING ISSUES ANALYSIS (model worksheet, below)

PART B. ISSUE ANALYSIS WORKSHEET (a worksheet will be provided)

PART C. EVALUATIVE QUESTIONS

1. Have you accurately identified all of the major rationales/ beliefs associated with each party's stated position(s)?

2. Have you been able to identify the type(s) values which are reflected in each party's stated rationale(s) and beliefs? If not, why not?

PART D. SUMMARY QUESTIONS

1. From the information available to you, what do you perceive to be the immediate ecological implications of each of the positions you have identified (i.e., for the next 10 years)?

2. Similarly, what do you perceive to be the short-term ecological implications of each position you have identified (i.e., for the next 10 to 50 years)?

3. Finally, what do you perceive to be the long-term ecological implications of each position you have identified (i.e., for longer than the next 50 years)?

4. Based upon your analyses, how do the various positions compare in terms of their ecological implications?

MODELING ISSUE ANALYSIS: AN EXAMPLE WORKSHEET

WHAT IS THE ISSUE? Whether or not to commercially cut the downed timber which resulted from the Mount St. Helens eruption OR to set the area aside as a recreation/ecological area.

THE PARTIES (PLAYERS) AND THEIR POSITIONS	RATIONALES/BELIEFS	VALUES
The Lumber Industry: We should be allowed to enter this area and salvage the downed timber.	The lumber is available. It is an important and profitable resource.	Economic
Mount St. Helens Protection Assn.: This area should be set aside in the form of a national monument. No lumbering activity should be allowed, although certain forms of recreation should be.	1. This area has great potential for wilderness recreation.	Recreational
	2. The beauty of this wild area is almost without equal. Such wilderness beauty is an important resource for all people.	Aesthetic
	3. Preservation would provide an opportunity for the public to observe ecological processes.	Educational
Ecological Society: This area should be set aside as a National Ecological Study Area. It should be studied scientifically. No lumbering or recreation should be allowed.	The area provides a unique opportunity to observe the recolonization of a volcanic area by native plants and animals.	Scientific

Your Position on This Issue:

INFUSION ACTIVITY FOR ENVIRONMENTAL SCIENCE

ACTIVITY: The Identification and Comparative Analysis of Alternative Solutions for Remediating Environmental Issues

GOAL: Goal Level II (The Conceptual Awareness Level) ... Goal 8: identify and communicate the viable alternative solutions for remediating crucial environmental issues as well as the ecological and cultural implications of these solutions; and Goal Level III (The Investigation and Evaluation Level) ... Goal 14: demonstrate the ability to identify alternative solutions for important issues and the value perspectives associated with these solutions; and Goal 15: demonstrate the ability to evaluate alternative solutions and associated value perspectives for important issues with respect to their ecological and cultural implications.

PREREQUISITES: Prior to the use of these worksheets, students should be knowledgeable about a wide variety of Environmental Issues (i.e., both problem and solution-related issues), about the Costs associated with Environmental Improvement, and should have been introduced to both the various Levels for Influencing Change and the various Processes for Initiating Positive Environmental Change.

The Identification and Comparative Analysis of Alternative Solutions for Remediating Environmental Issues

PURPOSE: For pre-service teachers, the outcomes of this activity should include their ability to: (a) identify a number of general approaches for remediating environmental issues, and a number of specific alternative solutions for remediating a specific issue; (b) adequately define an issue and its component parts as a prerequisite to identifying alternative solutions for that issue (i.e., including interested parties); (c) adequately define and analyze an alternative solution for remediating a specific issue (i.e., including required resources, procedures, and potential consequences); and (d) comparatively analyze several alternative solutions for remediating a specific issue.

ALTERNATIVE SOLUTIONS: There are a number of useful ways of looking at alternative solutions for remediating issues. First, one could define them in terms of the various kinds of activities or behaviors people engage in when attempting to remediate issues (e.g., consumer, legal, political, persuasive, or resource-related activity). Second, one could describe them in terms of the level at which people attempt to remediate issues (i.e., household, municipal, county, regional, state, national, or international). In this activity, a definition of alternative solution is used which in some ways subsumes or combines both of these.

For the purposes of this activity, the general approaches which tend to exhibit the greatest potential and actual utility in the remediation of environmental issues include:

A. Citizens: this includes solution-oriented approaches which primarily depend upon individuals (e.g., homeowners, consumers) and/or ad hoc (e.g., grassroots) groups;

B. Established Social Groups: this includes solution-oriented approaches which primarily depend upon social organizations (e.g., national level environmental organizations) or institutions (e.g., religious bodies);

C. Political Approaches: this includes solution-oriented approaches which primarily depend upon governmental agencies (e.g., resource management and regulatory agencies), political parties, and other kinds of political organizations;

D. Economic Approaches: this includes solution-oriented approaches which primarily depend upon some form of economic intervention (e.g., price adjustments, rebates, tax incentives);

E. Technological Approaches: this includes solution-oriented approaches which primarily depend upon some form of technological intervention (e.g., tools, materials, and procedures used in the areas of environmental or genetic engineering); and

F. Other: this includes solution-oriented approaches other that those covered by the above approaches.

STRUCTURE OF THE ACTIVITY: This activity is composed of four parts. In the first part, the teacher's initial role is to help the students select a single target issue of interest to them (i.e., one they want to explore in terms of remediation), and thereafter, to guide discussion over the six questions presented on the Part 1 Worksheet. This will help students develop a common definition of the select issue.

To begin part two, the teacher should break the class up into teams of between three (3) and six (6) students. Each team is expected to select one of the general approaches for remediating environmental issues (See Alternative Solutions) such that all approaches are covered. Teams working with the same approach should explore different alternative solutions. After this is completed, the teacher should distribute copies of the Part 2 Worksheet to each team, indicating that each team is responsible for a completed set of responses.

After the teacher reviews each team's set of responses to Part 2 questions, the teams should be provided with the Part 3 Worksheet. As in Part 2, this portion of the activity is to be completed by each team. In this case, the teams are asked to review responses to previous questions as a prerequisite for conducting a basic force-field analysis (i.e., an analysis of both driving and restraining forces). This is a critical aspect of real-life issue/action analysis, and students should be encouraged to think these questions through very carefully.

After responding to the Part 3 questions, the teacher should re-assemble the class. Each team should have an opportunity to present their alternative solution to the class, and to respond to questions from other students. The teacher should then use the questions presented in the Part 4 Worksheet to encourage students to draw and discuss conclusions about their own alternative solution, as well as about the various alternative solutions developed by the class.

TO THE STUDENT: During the course of this activity, you will be asked to respond to four sets of questions. Each set emphasizes a particular step in the identification and analysis of alternative solutions for remediating an issue of the class' choosing. In order to generate adequate responses to many of these questions, you are probably going to need to do some background research. You may even find that you need to do some research in a different area for each sets of questions. The more effort that individuals and teams put into this preparation, the more interesting and beneficial this activity will be for you.

WORKSHEETS: The Identification and Comparative Analysis of Alternative Solutions Worksheet includes four sets of questions. Students will need more space to respond than has been provided.

PART 1 WORKSHEET: BACKGROUND QUESTIONS RELATED TO THE TARGET ISSUE

Team: _____

1. What is the environmental issue you wish to identify and analyze alternative solutions for? Be as specific as you can.

2. What is the scope of this issues (i.e., where and to whom are the effects of this issue evident)?

3. In brief, what are the major bio-physical conditions which are associated with this issue (e.g., species, soil, oil reserves)?

4. In brief, what are the major socio-political conditions which are associated with this issue (e.g., demographics, values)?

5. Who appears to have a major interest in or has expressed an important position on this issue (e.g., individuals, groups, agencies, businesses, etc.)?

6. Of these interested parties, which are/not supportive of a sound environmental solution? Further, which of these parties either has not made a decision, or could have their position influenced?

PART 2 WORKSHEET: IDENTIFYING AND DESCRIBING YOUR ALTERNATIVE SOLUTION FOR THIS ISSUE

Team: _____ Your Approach: _____

1. Title of Your Alternative Solution: _____

2. Description of this Alternative Solution:

3. What resources would be required to carry out this solution? In your response, you should make an effort to include resources within each of these categories: (a) Financial resources, (b) Material resources, (c) Human resources (e.g., skills, time and energy, values, courage), and (d) Other resources.

4. What procedures would one follow to carry out this solution? In your response, you should give adequate consideration to procedures in the following areas: (a) Decision-making, (b) Planning and Preparation, (c) Implementation, and (d) Follow-up and Evaluation.

5. What are the possible and probable consequences of carrying out this solution? In your response, be sure you attempt to assess if there are likely to be any recognizable short-term and/or long-term consequence in the following areas, and if so, what those are likely to be: (a) Ecological; (b) Economic; (c) Legal; (d) Political; (e) Social/Societal; and (f) Other (e.g., Educational, Recreational).

PART 3 WORKSHEET: DRIVING AND RESTRAINING FORCES LIKELY TO AFFECT YOUR ALTERNATIVE SOLUTION FOR THIS ISSUE

Team: _____ Your Approach: _____

Your Alternative Solution:

1. Of the factors you identified in Parts 1 and 2, which do you consider to be driving forces (i.e., forces which are likely to support or advance your solution)? In preparing your response, be sure to review information pertaining to: (a) interested parties, (b) required resources, (c) procedures, and (d) potential consequences.

2. Of the factors you identified in Parts 1 and 2, which do you consider to be restraining forces (i.e., forces which hinder or block your solution)? Again, in your preparing your response, be sure to review information pertaining to: (a) interested

parties, (b) required resources, (c) procedures, and (d) potential consequences.

PART 4 WORKSHEET: SYNTHESIS-ORIENTED QUESTIONS RELATED TO THE ANALYSIS

Student: _____

1. For your particular solution, do the driving forces appear to outweigh restraining forces?

2. Can you think of ways to overcome the primary restraining forces you have identified?

3. After reviewing each of the alternative solutions identified by your classmates, which would require the fewest resources? Which would be the easiest to carry out? Is either of these the most effective alternative?

4. From amongst the various alternative solutions, which appears to hold the least potential for negative consequences (i.e., ecological, economic, legal, political, and social/societal)?

5. From amongst the various alternative solutions, which appears to hold the greatest potential for positive consequences (i.e., ecological, economic, legal, political, and social/societal)?

6. From your review of these alternative solutions, would you advocate any single alternative, or some combination of alternatives as the best means to remediate this issue?

INFUSION ACTIVITY FOR SOCIAL STUDIES METHODS

ACTIVITY: Planning for Citizen Action

GOAL: Goal Level IV (The Environmental Action Skill Level) ... Goal 18: demonstrate a competence with a variety of citizenship action skills from the following categories of skills: persuasion, consumer action, political action, legal action, and ecomanagement; and Goal 19: evaluate selected actions in light of their ecological and cultural implications.

PREREQUISITES: Prior to the use of these worksheets, students should have covered from the Essentials of the Social Studies up through Social Studies and Special Issues. In addition, students should have been introduced to the tradition of Social Studies as Citizenship Education, including the topic and various examples of responsible citizenship behavior.

The Action Planning Worksheet

PURPOSE: For pre-service teachers, the outcomes of this activity should include their ability to: (a) identify and adequately analyze an issue that they wish to take action on; (b) identify and define a means for resolving that issue, and an action they would take as part of that resolution; (c) identify and defend the use of a set of criteria to critically analyze a proposed action; and (d) develop a detailed plan for implementing a proposed action. If pre-service teachers elect to implement an action of their own design, these outcomes should also include their ability to: (e) monitor an action as it is being implemented; and (f) assess the impacts and outcomes of that action once implementation has been terminated.

RESPONSIBLE CITIZENSHIP BEHAVIOR (RCB): In very general terms, RCB refers to a broadly defined set of action-oriented behaviors (i.e., behavioral construct) which citizens might engage in an effort to improve or maintain the quality of their lives. It is difficult to provide a more precise definition than this for several reasons. In part, this is because the term 'citizenship' may refer to any of several levels of one's socio-political affiliations (e.g., with a state, a nation, or the planet). In addition, such affiliations are likely to vary greatly among users of this manual, and therefore have a bearing on what may be termed 'responsible'. While the term 'responsible' implies the presence of some criteria regarding the intentions and consequences of behavior, the specification of acceptable intentions and consequences is usually undertaken with certain socio-political parameters in mind (e.g., what may be considered responsible for citizens in a democratic nation may differ from what is considered responsible for citizens in a non-democratic nation).

Consequently, the easiest term in this phrase to define appears to be 'behavior'. Here, 'behavior' refers to autonomous actions which individuals engage in, whether alone or in groups. For this reason, terms which refer to the behavior of citizens, such as 'citizen participation' and 'citizen action' are often used as synonyms for RCB in some nations/societies. However, even this may not be the case in all nations/societies.

There is another way of defining RCB such that it is more useful with respect to the environmental orientation of this activity. In this case, the phrase 'Responsible Citizenship

Behavior' may be seen as an umbrella which covers the many different types of responsible behavior that citizens may engage in. Consider this example. The United States Government adopted the National Environmental Policy Act in 1969, establishing quality of the environment as a national policy goal. Through this and subsequent legislation, citizens in that country have been encouraged to engage in 'Responsible Environmental Behavior' (REB). In this context, REB serves as one type of, and therefore as a subset of RCB.

One need not wait for their nation/society to establish a similar National Policy before they consider engaging in REB. In fact, many would argue that as inhabitants of the planet Earth, people have an inherent obligation to engage in REB. In this context, REB refers to the various kinds of behavior which improve or maintain the quality of the natural environment (i.e., ecological processes and phenomena). Hence, REB may also be defined as a behavioral construct, encompassing those behaviors whose intentions are to improve or maintain the natural environment, and whose consequences reflect some real improvement in or maintenance of that environment.

These two criteria serve as a general definition of the REB construct. Those behaviors which could be included under the REB umbrella must meet both of these criteria (i.e., they must be responsible toward the environment). However, this definition has its limitations, since one is likely to encounter disagreements as to whether particular environmental activities or actions should/not be considered responsible on the basis of other criteria. For example, most people/groups would agree that activities aimed at protecting some part of the natural environment (e.g., forested areas) which involve the destruction of another's property (e.g., bulldozing or logging equipment) should be not considered responsible, although some continue to defend these kinds of actions on environmental grounds. Thus, although behaviors may meet those initial two criteria, this does not mean that they should unquestioningly be accepted as REB.

In educational settings, it is the teacher's responsibility to help students think through and resolve these kinds of philosophical/psychological concerns before students engage in action. This is particularly important when an action is proposed in the context of a class project. To meet this responsibility, students should be provided with additional criteria which can be used to determine whether certain kinds of actions are indeed responsible or acceptable within their socio-political context (e.g., their community, state, nation).

In this activity, the following set of Action Analysis Criteria may be used for this purpose. Presented in the form of questions, these criteria include:

1. Is there sufficient evidence to warrant taking action on this issue?

2. What alternatives are available to us if we wish to take action on this issue?

3. Is the action we have chosen the most effective one available to us?

4. Do my/our personal values support involvement in this action?

5. Do I/we understand the procedures necessary to take this action?

6. Do I/we have the skills needed to take this action?

7. Do I/we have the courage to take this action?

8. Do I/we have the time needed to complete this action?

9. Do I/we have access to all of the other resources needed to make this action effective?

10. Are there legal consequences associated with this action?

11. Will there be any social consequences associated with this action?

12. Will there be any economic consequences associated with this action?

13. What are the ecological consequences of this action likely to be?

14. Are there additional criteria you should consider? If so, which one(s)?

STRUCTURE OF THE ACTIVITY: This activity consists of four parts. Throughout this activity, the teacher must recognize that, from an educational standpoint, they should provide opportunities for and even encourage students to engage in REB, though they should refrain from making demands on students to do so. The impetus for action-oriented behavior must reside with the student(s). Nonetheless, teachers must require that students develop the knowledge and skills which would permit them to engage in such behavior more effectively (e.g., issue analysis, action analysis, action planning skills). It may be useful to discuss this with students (and others) prior to this activity.

During the first part of the activity, students should be organized into working groups, and then asked to propose a means for remediating a local environmental issue which would involve them in some kind of REB. This would require students to: (a) identify and define their target issue; and (b) identify and describe in detail the solution they are proposing, and the kind(s) of REB they would engage in. Questions which teachers may rely upon to help guide students through these task have been included in Parts I and II of the Worksheet accompanying the Identification and Comparative Analysis of Alternative Solutions Activity (see pp 127-128). It should be recognized that the Action Analysis Criteria presented in the section on Responsible Citizenship Behavior have been embedded in Part II questions. It is crucial that students critically analyze their proposed solutions and actions before they begin to implement them. If it is deemed useful by the teacher, students may also be asked to respond to questions presented in Parts III and IV of that same Worksheet as part of this action analysis. Once their analysis has been completed, students should have the opportunity to present and discuss their results with the teacher and other students.

Once teacher and students have resolved any disagreements about a proposed action which might have arisen in the course of this action analysis, the second part of this activity may be introduced. Here, teachers should direct students to develop as detailed plan for implementing their proposed action as is possible or practical based upon the available information (i.e., at that time). In the simplest terms, this would involve defining their action as a set of designated responsibilities to accomplish specified tasks within an established timeframe (See Worksheet, Part II Questions). This mode of planning has been emphasized for two reasons: (a) it serves as a reiteration of, and therefore as a check on responses to the Action Analysis Criteria which pertain to procedures, skills, time, resources, and the like; and (b) individuals who are enthused about an action often need to pay additional attention to the organizational plan to make it happen. Lack of attention to details at this stage may lead to poor implementation. On the other hand, it may lead to preoccupation with details, whereby the larger purpose, the issues, and respect for others involved can be overlooked. It is up to the teacher to encourage students to maintain a balance between detailed planning and a holistic perspective.

In the event that students decide to carry out their proposed action after completing an action plan, they should be encouraged to monitor their implementation efforts and the effects of those efforts. The Questions included in Part III of the Worksheet are intended to help students along in these monitoring tasks. Teachers and students will undoubtedly find it useful to consider additional questions which pertain to the particulars of the action plan being implemented.

For those who implement their action plan, there will inevitably come a time when, for one reason or another, implementation will be terminated. Perhaps the action was completed, perhaps not. If and when students arrive at this point, it may be necessary for the teacher to 'debrief' those students. From an educational standpoint, students should be encouraged to discuss the impacts and outcomes of their action, as well as the events that contributed to them. Hindsight analysis, undertaken with the assistance of a skilled individual, can often result in significant insight (See Worksheet, Part IV Questions). However, from a personal standpoint, students may not be prepared to undertake this kind of analysis (e.g., in the event of 'failure' or problem of some sort). The psychological and emotional conditions of students must be carefully recognized and responded to under such circumstances.

TO THE STUDENT: The activity you are about to engage in is associated with the most important goal in environmental education: planning for responsible citizenship action. In the context of this activity, responsible environmental action is the type of citizenship action people engage in when they make an effort to improve or maintain the quality of the environment. In small groups, you are asked to select and define/analyze an environmental issue you would like to help resolve. As part of your effort to develop a plan of action for resolving that issue, you will be asked to do three things: (a) analyze your proposed action against a set of criteria to determine if in fact it would be a responsible action; (b) analyze it against a set of criteria to determine if it is a feasible action for you to undertake; and (c) develop a detailed plan to implement your proposed action. Whether or not you actually will implement your action plan is primarily, though not solely up to you. Your teacher should work closely with you as you analyze and plan your action, particularly if you wish to implement it. While implementing it might involve some known costs and risks, only you can weigh these against the benefits that could result from your action and a resolution of this issue. If you do decide to implement your action plan, monitor your efforts and assess your outcomes carefully!

WORKSHEET: The Action Planning Worksheet provided below is intended to be used in conjunction with (i.e., after) the Worksheet presented in the Identification and Comparative Analysis of Alternative Solutions Activity (see pp 127-129). The worksheet below is composed of three sets of questions. These sets of questions correspond with the second, third, and fourth parts of the activity.

PART II. ACTION PLANNING

1. If you were to break your proposed action down into smaller components, what would these components be? Can you define these components as tasks to be accomplished? (Note: If the resulting components are still too large/complex to be defined as tasks to be accomplished, you will need to try to further break them down until they can be defined as tasks.)

2. Define as many of these components as you can (at this time) as tasks to be accomplished.

3. What kinds of resources are needed to carry out each of those tasks? Do you have access, or can you gain access to those resources? How?

4. Does there appear to be any natural or logical sequence for accessing resources and/or carrying out those tasks? If there appears to be one, lay them out on paper in this sequence. Further, if and when you have developed what appears to be a workable sequence, try to place this sequence in some kind of timeframe (i.e., break it down on a day-to-day, week-to-week basis).

5. Who will be responsible for accessing/providing resources, and for carrying out each of the tasks in this sequence? Do you have enough people to actually carry out the tasks? Is anyone likely to be overburdened?

6. Have you prepared a contingency plan (i.e., a 'Plan B')?

PART III. IMPLEMENTING YOUR ACTION PLAN

1. As you begin to implement your plan, is your decision-making process adequate for the circumstances you encounter? Is information shared openly and in a timely fashion?

2. Have internal communication and coordination responsibilities been adequately defined, assumed, or shared? For example, who is responsible for arranging and communicating meeting times? For setting meeting agendas? For managing financial resources?

3. Have external communication and coordination responsibilities been adequately defined, assumed, or shared? For example, is there a media contact person or spokesperson? A contact person or other individuals/groups?

4. Are circumstances unfolding as you had anticipated? Do you need to revise your agenda? Your time frame? Your mode of operation?

Part IV. ASSESSING THE IMPACTS AND OUTCOMES OF YOUR ACTION

1. At what point (in your plan) did you terminate your action?

2. What impact, if any, did you have on the target issue (e.g., visibility, resolution)? Did you accomplish any of the environmental agenda you set out to accomplish? Was it sufficient to considered your action successful?

3. Were there any noticeable social consequences which resulted from your action? Legal consequences? Political consequences? Economic consequences? Were these consequences greater for you, or for others? Would you consider any of these to be 'negative' consequences?

4. What were the primary outcomes for those involved in carrying out the action? What did you learn about the issue? About action? About others? About yourselves?

INFUSION ACTIVITY FOR ORGANIZING AND DIRECTING INSTRUCTION

ACTIVITY: Developing an Environmental Education Lesson

GOAL: Goal Level Y (The Instructional Application Level) ... Goal 21: demonstrate the ability to effectively select or develop, as well as implement instructional materials designed to assist in the development of environmentally literate students, i.e., who are both competent with and willing to apply critical environmental knowledge and skills.

PREREQUISITES: Prior to this activity, students should have covered the relationship that exsits between goals and instruction, the use and implementation of the General Teaching Model (GTM), preparation of instructional (learner) objectives, and student evaluation. In addition, for this activity, a thorough familiarity with the Goals for Curriculum Development in Environmental Education is important.

A Format for Developing an EE Lesson

PURPOSE: For pre-service teachers, the outcomes of this activity should include their ability to: (a) select a topic appropriate for development as an environmental education lesson; (b) define the curricular context for a lesson on that topic (i.e., grade/age level, goals, subject/course in which it will be taught, content emphasis, and prerequisites); (c) prepare instructional objectives for a lesson which are consistent with a given curricular context; (d) select and/or develop resource materials for use by instructors and by students which reflect a set of instructional objectives (e.g., information sources on the topic for teachers, material for students to work with, audio-visual material, and evaluation materials); (e) design an activity sequence for teaching a topic in a defined curricular context using identified resource materials to accomplish an established set of instructional objectives; and (f) identify and communicate information required by/useful to an instructor prior to their implementation of a given activity sequence (i.e., background information on the topic, tips on teaching the lesson, amount of time it will take to teach the lesson, preparation required for teaching the lesson).

STRUCTURE OF THE ACTIVITY: In this activity, it is strongly recommended that each student should be responsible for completing a lesson plan, as this is a crucial part of the pre-service experience. It is the teacher's responsibility to provide students with: (a) a lesson plan format; (b) guidance on the selection of topics; and (c) guidance during the development of their lessons. The format presented in the Worksheet below should be generic enough to accommodate most types of lessons students may wish to develop. Nonetheless, it is recognized that, for one reason or another, this format may need to be modified, and in rare cases, may even need to be replaced (e.g., where states or nations have a prescribed format which differs from this one).

Once students have been provided with a lesson plan format to use in this activity, that format should be discussed with them. At that time, teachers should present model examples, their expectations and/or their evaluation standards in order to clarify for students what a final

lesson plan should include (or look like). Once a student selects a topic and begins to prepare a lesson outline around that topic, he/she may find that they need to revise the format provided to them. Unless told otherwise, any revision in the format should be agreed to by the teacher as early in the lesson planning process as is possible.

Teachers may also wish to provide some guidance on the types of environmentally-related topics students choose to develop their lesson plans around. Students should be encouraged to develop lessons around topics that are educational for youth. On a more immediate basis, educational means relevant to the lives of and motivating for youth. In a broader context, educational means capable of contributing to the development of environmentally literate youth (i.e., youth who are both competent with and willing to apply critical knowledge and skills to the resolution of environmental issues).

If this will be the first full lesson plan that students develop, teachers may decide to review their plans in several stages of completion. When teachers decide to do this, they must be cognizant of the fact that the sequence followed in developing a lesson plan is likely to be very different than the sequence presented for implementing that plan. Consequently, the format provided in the Worksheet should not be used to guide the review of plans in various stages of completion, since it reflects an implementation sequence. Rather, the statement of Purpose for this activity represents a more appropriate sequence for reviewing plans in various stages (i.e., topic, curriculum context, objectives, resource materials, the activity, information for the instructor).

Once students have completed their lesson plans, the teacher may provide students with the opportunity to present their plans to the class. This may be done on a selective basis, such that only the higher quality lesson plans will be discussed. Teachers and students alike should attempt to insure that the lessons: (a) evidence a high degree of internal consistency; (b) are age and goal level appropriate; (c) present activities whose contribution to environmental literacy can be demonstrated and/or defended; and (d) present activities that are motivating/interesting for the students they are intended to be used with.

TO THE STUDENT: In this activity, you will be expected to develop one complete lesson plan for teaching an environmental education topic of your choosing. This may not be as easy as it first sounds. The lesson plan format you are to follow will be provided by your teacher. Further, the topic you choose and the lesson you develop around it must be educationally defensible (i.e., in terms of its value for youth and its contribution to environmental literacy).

As you begin to piece together your lesson, you should be careful. If you look upon your lesson plan format as a set of separate sections, you could well wind up frustrated and confused. Most lesson plans cannot be pieced together section by section, because the sections are usually interconnected. For example, when you change one objective, you must check to see how well the new objective fits your goal(s) and grade level, the instructional resource materials you plan to use, your activity sequence, and your evaluation strategy. In this case, changes in one section can lead to changes throughout the lesson plan. All of this has been said to indicate to you that one important characteristic of any completed lesson plan is internal consistency amongst its parts. However, you must keep in mind that, as important as internal consistency may be, its sole purpose is to enhance the educational value of your lesson. In no case can internal consistency be substituted for educational defensibility.

WORKSHEET: A Format for Developing an EE Lesson is presented below. It is a slightly expanded version of the format used in two of the example activities presented in PART IV of this document. The first three segments of the format below closely parallel the format used to

present the Consumer Product Need and Environmental Cost Assessment Activity (i.e., the activity used to demonstrate the application of the General Teaching Model). The fourth segment of the format below reflects the kinds of resources presented within The Acid Rain Issue: A Sample Case Study Outline (i.e., the activity used to demonstrate the Case Study Format of Issue Instruction). If you have any questions about this format you are referred back to these sections in PART IV of this document. In each section, students will need more space to respond than has been provided.

I. CURRICULAR EMPHASIS

A. Title of the Activity:

B. Grade/Age Level(s):

C. Environmental Education Goal Level and Goal(s):

D. Subject/Course to be Taught in:

E. Content Emphasis (Concepts, Skills, and/or Attitudes):

F. Prerequisites to this Activity:

G. (Optional) Mode of Integration with Other Subjects (e.g., Math, Social Studies, Language Arts):

II. INSTRUCTIONAL PLANNING AND PREPARATION

A. Instructional Objectives:

B. To the Instructor (Background, Teaching Tips, Instructional Time, and Preparation):

C. List of Student Materials for this Activity:

III. THE ACTIVITY

A. Introduction (or Overview or Advance Organizer):

B. The Activity:

C. Summary (or Synthesis):

D. Evaluation Strategy:

IV. RESOURCE MATERIALS (As needed for this activity)

A. Sources of Information for Teachers:

B. In-class Resource Materials for Students (Print and Non-Print):

C. Out-of-Class Community/Regional Resources Needed:

D. Audio-Visual Materials:

E. Evaluation Materials:

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" . . . there is a harmony in the natural world which makes the right thing easy and the wrong thing chaos; . . . the right thing is revealed in being right, not just for now and for us, but for the earth and all those who will inherit it; . . . there are natural principles, if we can discover them, to guide everything men may wish to do with land and water and the life they support. "

Durward Allen

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GLOSSARY OF TERMS

Abiotic: nonliving; an abiotic variable in an ecosystem would be exemplified by such things as light, rain, moisture, heat, bedrock, and topography.

Access: to get; to secure, acquire.

Acid Rain: Rainfall (or fog) which is more acidic than normal, often caused by an infusion of sulfur and nitrogen compounds from vehicular exhausts and coal burning power plants.

Adaptation: a particular attribute which contributes to an organism's survival in a community, e.g., protective coloration.

Ad Hoc: special or temporary, as in an ad hoc committee.

Advocacy: pleading a cause of another person; the act of advocating; supporting.

Affective: relating to feeling, emotion, or desire.

Agrarian: pertaining to farming, agriculture. An agrarian society is one in which the economy and culture are tied mainly to agricultural (rather than industrial) enterprises.

Ancillary: subordinate; of related but not of primary importance.

Artifact: a product of human workmanship, esp. of a primitive nature. Loosely, something left over from the past.

Astute: keen in judgement.

Axiology: a study of the nature, types, and criteria of values and of value judgements.

Behavioral (in an educational context): pertaining to actions of an individual, behaviors; often referred to in education as an action/behavior which is observable, overt.

Belief: that which a person holds to be true.

Biogeochemical cycles: those chemical cycles that are critical to the maintenance of ecosystems, e.g., nitrogen cycle, calcium cycle.

Biosphere: that relatively thin "shell" surrounding the earth that supports life.

Citizenship action skills: skills related to the actions and behaviors which citizens have at their disposal in working toward the solution of environmental issues.

Cognitive: related to the mental processes by which knowledge is acquired; cognitive may relate to either an individual's knowledge or an individual's ability to process knowledge.

Community: in an ecological sense, an interacting and interdependent set of plants and animals, e.g., a prairie community, a pond community.

Conceptual: relating to mental images held by individuals and associated with events and objects; ideas.

Consumerism: an economic threat by an individual or a group aimed at some form of behavior modification in business or industry, e.g., boycotting, discriminating and conservative use of goods and services.

Contingency: an adjunct or accessory; a contingency plan would be a plan that could be substituted for the primary one.

Criteria: standards; rules by which something is judged or evaluated.

Critical thinking skills: those mental processes which enable a human being to process information in logical ways; cognitive problem solving skills; science and social studies process skills are critical thinking skills.

Demographic: relating to populations and the study of them, e.g., births, deaths, marriages, health, etc.

Designee: an appointee; an individual designated for some task.

Didactic approach: an educational (instructional) methodology focusing mainly on a lecture delivery format, deductive in nature; the teacher as the source of knowledge.

Dynamic equilibrium: a tendency toward homeostasis; stability over time with periodic fluctuations.

Ecology: the scientific study of the interrelationships that exist between organisms and between organisms and their physical environment.

Ecomanagement: any physical action taken by an individual or a group aimed directly at maintaining or improving the existing ecosystem(s), e.g., reforestation, landscaping, installing bird boxes.

Ecosystem: an aggregate of plants and animals which are interdependent plus the abiotic variables with which they interact; typically thought of as self-contained in the sense that many of the essentials for life can be cycled and recycled within that system.

e. g.: symbol for "for example".

Elementary education: in education, the early years; sometimes the first six years of education; rarely used as a synonym for primary education.

Empathy: a feeling for; sympathetic identification with something, such as empathy for an endangered species.

Empirical: based on observation; founded on direct experience or experimentation; scientific.

Empiricism: the mode of thought which is typically scientific in nature, a philosophy focusing on the reality of observation and experience as the basis of truth; scientific method.

Energy pyramid: the tendency for usable energy to be lost as it moves through a food chain; often a diagrammatic representation of available energy at various stages in a food chain.

Energy transfer: in ecology, the movement of energy from one life form to another in a food chain.

Entropy: a measure of the degree of disorder brought about by an increasing complexity within a dynamic system; a thermodynamic measure of energy unavailable for useful work in a system undergoing change.

Environmental action skills: see "Citizenship action skills".

Environmental education: that aspect of education that develops individuals who are environmentally knowledgeable and, above all, skilled and dedicated to working, individually and collectively, toward achieving and or maintaining a dynamic equilibrium between the quality of life and the quality of the environment.

Environmental Impact Assessment: An evaluation of the extent to which certain activities will negatively impact/influence the environment.

Environmental issue: a problem with obvious environmental overtones surrounding which one can observe differing human beliefs and values.

Environmental literacy: that state in which an individual is environmentally knowledgeable and, above all, skilled and dedicated for working, individually and collectively, toward achieving and/or maintaining a dynamic equilibrium between quality of life and quality of the environment. (Paraphrased from Harvey, 1977)

Environmental sensitivity: a set of affective characteristics which result in an individual viewing the environment from an empathetic perspective.

Epic: 1. a narrative poem celebrating episodes of a people's heroic tradition; 2. grand, heroic.

Epistemology: relating to the nature of knowledge; that part of philosophy which deals with the origin, nature, and limits of knowledge.

Erosion: the processes by which the materials of the earth's crust are transported from one location to another by forces such as gravity, wind, water, and glacial ice.

Espouse: to take up a cause; to take up as a supporter of a cause.

Feasible: possible; if something can be done it is feasible.

Food chain: a linear pattern describing the flow of energy through an ecosystem; typically beginning with a food producing plant being eaten or partially eaten by a herbivore which is, in turn, consumed by a carnivore, etc.

Food web: a set of interrelated food chains within a given ecosystem.

Formal educators: those educators who typically teach within the constraints of the traditional school; classroom teachers.

General studies curriculum: the set of courses which baccalaureate students are required to complete prior to graduation; sometimes thought of as those courses in a liberal arts curriculum.

Genetic equilibrium: a pool of genetic variations in a state of equilibrium, observed within a species population; genetic equilibrium will be maintained if mutations do not occur, if changes in gene frequency are insignificant, and if reproduction within the population is random.

Genre: a distinctive class or category of literary composition, e.g., poetry, short story.

Hierarchy: an organization of things arranged one above the other according to a logical order, e.g., a hierarchy of goals.

Homeostasis: the tendency to maintain normal internal stability in an organism or an ecological system, such as a hardwood forest, by coordinated responses of the system's components, compensating for environmental changes.

Humidity: a measure of the amount of moisture in the air.

i.e.: symbol for "that is".

Impetus: a driving force; incentive; stimulus.

Infusion: an injection of one thing into another; the process of infusion; as used here, injecting traditional course content with appropriate/logical environmental content, skills, and activities.

Integrated process skills: to integrate is to bring together parts into a whole; as used here, to combine one or more simple process skills into a more complex/powerful one, e.g., combining several prerequisite skills in order to "experiment".

Irreconcilable: not reconcilable; problems which cannot be resolved are considered to be irreconcilable.

Issue investigation skills: those skills which will permit the learner to successfully research an issue, resulting in appropriate conclusions, inferences, and recommendations.

Learner objectives: those objectives prepared for the student to learn/accomplish; objectives which will be met through instruction, usually stated in performance (behavioral) terms.

Legal action: any legal/judiciary action taken by an individual and/or organization which is aimed at some aspect of environmental law enforcement - or, a legal restraint precedings some environmental behavior perceived as undesirable, e.g., law suits, injunctions.

Limiting factors: in ecology, those variables which tend to put limits on the development of an ecosystem or on the activities of an organism; anything present in insufficient amounts so that an organism's survival and/or reproduction is restricted.

Lithosphere: that part of the earth's crust made up of solid material, as opposed to the "hydrosphere".

Mount St. Helens: a volcano that erupted in the state of Washington (USA) in 1980.

Natural selection: the survival of a genetic form over time as a result of a particular adaptation favoring that organism.

Niche: an organisms's role in a community; not to be confused with where an organism lives.

Nonformal educator: the educator who provides instruction in settings beyond the traditional confines of a formal classroom, e.g., a teacher in an environmental center.

Opinionnaire: a survey instrument designed to assess the opinions of a particular population of human beings on a specific topic.

Organismic homeostasis: the organism in a state of dynamic equilibrium, controlled by homeostatic mechanisms within the organism itself.

Parameter: a limit; boundary.

Performance objective: See "learner objective".

Persuasion: an effort, verbally, to motivate human beings to take positive environmental action as a function of modified values, e.g., argumentation, debate, speech making, letter writing.

Phenomena: events; happenings that may be observed. Singular: phenomenon.

"Player" (in an issue): someone involved in an issue, a person having definite beliefs (and a particular position on the issue) and certain supporting values.

Political Action: an effort aimed at persuading an electorate, a legislator (or legislature), or executive governmental agency to conform to the values held by the person or persons taking that action, e.g., lobbying, voting, supporting candidates.

Population dynamics: those interactions which can be observed taking place within a particular species population; population dynamics often refers to those variables which influence the population size of an organism over time in a given ecosystem/biome.

Portray: to make a picture of image of; to depict in words; to describe vividly.

Prerequisite: required before; necessary as a preliminary to a proposed act.

Primary source of information: a source of information which represents an original source of knowledge, e.g., information from the people actually involved in an environmental issue as opposed to information from an article written about those people.

Professional education curriculum: those professional education courses having a bearing on the training of teachers and demanded of teacher education students, e.g., methods courses in the content areas, philosophy of education, education psychology.

Proponent: one who makes a proposal; an advocate.

Psychomotor: related to physical skills, as with someone with unusually fine motor skills, coordination.

Questionnaire: a survey instrument designed to gain information held on a particular topic by a certain population of human beings, e.g., college students, the general public, wildlife biologists.

Radioactivity: the property of being radioactive; the radiation given off as a consequence of radioactive decay, e.g., the radioactive decay of plutonium.

Rationale: an explanation; an underlying reason.

Remediate: to remedy, to restore, cure.

Rhetoric: a display of language; often referred to as the ability to use language in such a way as to persuade or influence others.

Rock cycle: the dynamic processes taking place in the earth's crust which transform rocks from one rock type to another, e.g., the transformation of a sedimentary rock into a metamorphic one.

Scenario: the outline or synopsis, step-by-step, of a plot or an event; contains all the details of a plot or an event.

Science processes: those critical thinking skills a scientist uses to collect data or solve problems, e.g., hypothesizing, experimenting, inferring.

Scientific literacy: the state of being literate in science; an awareness of and ability to use science, its content, processes, and applications.

Secondary source of information: a source of information at least one time removed from the primary/original source, e.g., reading an article written about an issue as opposed to investigating that issue on a first-hand basis.

Simulation: something that assumes the appearance of reality without being real; the act of simulating; feigning.

Solicit: to seek to acquire; to plead for; to request.

Species population: an interacting group of organisms belonging to the same species; not to be confused with the species as a whole.

Stance: a position; someone's posture on something.

Strip mining: the removal of the surface layers of soil and rock so that important mineral deposits can be removed for use by man.

Subsumes: include under; to take up; specifics are subsumed within the general, or individuals are subsumed within populations.

Succession: the progression of plant communities from one to another in a given locality; often begins with a pioneer community progressing through a series of plant communities toward a climax plant community.

Survey: a mechanism for gathering information about something, e.g., a survey of abandoned vehicles in Jackson County, Illinois, a survey of public opinions concerning the acid rain issue; to take a broad or comprehensive view of something.

Synthesis: a combination of parts as to form a whole; building up something from its elements; combination of thoughts into a whole; the opposite of "analysis".

TEP: acronym for "teacher education programme".

Tertiary instructor: a teacher at the college level.

Value (i.e., a value): an established ideal; a way of acting; the perceived worth of something, e.g., the perceived worth of wildlife.

Values clarification: the process an individual goes through as he/she inspects the bases for a value perspective, e.g., the process and individual would go through as he/she seriously inspects a personally and particularly strong economic value.

Value position: the value category underlying a particular belief statement or verbalized position on an environmental issue, e.g., a person who wants to preserve a marsh because there is good duck hunting there is reflecting a recreational value position.

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"When we try to pick out anything by itself
we find it hitched to everything else in the universe."

John Muir

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